PNEUMOCONIOSIS ABSTRACTS

VOLUME III

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The Honorary Managing Committee of the
Bureau of Hygiene and Tropical Diseases

Published for
BUREAU OF HYGIENE AND TROPICAL DISEASES
by
PITMAN MEDICAL PUBLISHING CO. LTD.

First published 1959

PITMAN MEDICAL PUBLISHING COMPANY, LTD.
39 PARKER STREET, LONDON, W C 2

ASSOCIATED COMPANIES
SIR ISAAC PITMAN & SONS, LTD.
PITMAN HOUSE, PARKER STREET, KINGSWAY, LONDON, W C 2
THE PITMAN PRESS, BATH
PITMAN HOUSE, BOUVERIE STREET, CARLTON, MELBOURNE
27 BECKETTS BUILDINGS, PRESIDENT STREET, JOHANNESBURG
PITMAN PUBLISHING CORPORATION
2 WEST 45TH STREET, NEW YORK
SIR ISAAC PITMAN & SONS (CANADA), LTD
(INCORPORATING THE COMMERCIAL TEXT BOOK COMPANY)
PITMAN HOUSE, 381-383 CHURCH STREET, TORONTO

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FOREWORD

This volume is a sequel to the two preceding volumes of *Pneumoconiosis Abstracts* which were published in 1953 and 1954. These volumes contain abstracts reprinted from the *Bulletin of Hygiene*, the first volume covered the years 1926 to 1938, the second 1939 to 1950, and the present volume covers the years 1951 to 1955 inclusive. The set of three volumes, therefore, contains a comprehensive collection of abstracts of the important papers published in this field during a period of 30 years.

In each volume, the abstracts are arranged in logical order, but readers will note that papers by the same authors are sometimes published together in series and some may accordingly appear to be in inappropriate sections. This has been done deliberately to show the trend of research.

The first two volumes were published by Sir Isaac Pitman and Sons, Ltd. and the text was re-set in type. In the present volume the abstracts have been reproduced by Messrs. Butler and Tanner by a photographic process and the volume has been published by the Pitman Medical Publishing Company. [illegible] *Hygiene*. Page numbers quoted in these references therefore are not necessarily those of the present volume, but to assist the reader, the relevant page numbers in this or the earlier volumes have been printed as footnotes. A few references concern papers not included in *Pneumoconiosis Abstracts* and these have been left without annotation.

Acknowledgment is made to the many abstracters who gave their time and thought and knowledge to the compilation of these abstracts. Acknowledgment is also made to Mr. J. Rathborn, formerly Secretary of the Bureau, who carried out the preliminary selection and sorting of the abstracts and who constructed the index.

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January, 1959

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SECTION I

GENERAL

General—History—Epidemiology—Aetiology—Pathology—Respiratory Functions—Radiology—Clinical Findings—Treatment—Prevention—Legal Subjects

INTERNATIONAL LABOUR ORGANISATION **Third International Conference of Experts on Pneumoconiosis, Sydney, February–March 1950. Record of Proceedings.** Vol I pp. xi + 323 mimeographed. Vol II pp iv + 337 mimeographed. 1953 Geneva International Labour Office

This Conference was attended by delegates from Australia, Canada, Denmark, France, New Zealand,

essential remarks in concentrated form, its value and interest may be enhanced As it is, there is ample evidence of the thoroughness and care given to the various items under discussion, and the wealth of experience available

graphic purposes only, and not for any other purpose such as the assessment of clinical conditions or disability There follow the papers presented to the Conference, which occupy about the remaining half of volume 1 and the whole of volume 2 Some of these papers include illustrations, and many contain useful references

The Conference first considered the definition of *pneumoconiosis*, and Dr. MIDDLETON contributed an excellent comprehensive paper describing the reactions produced by different kinds of dust in the lungs [Incidentally, he has some serious words to say about the practice of returning to grain the dust which has separated from it in various stages of handling, so as to maintain the weight.] The subject obviously bristles with difficulties and the Conference eventually accepted the following definition, which does not appear to the reviewer to have entirely solved the problem

> " Pneumoconiosis is a diagnosable disease of the lungs produced by the inhalation of dust, the term ' dust ' being understood to refer to particulate matter in the solid phase, but excluding living organisms."

One of the most interesting discussions was that on Recent Advances in the Pathogenesis and Pathology of the Pneumoconioses The numerous subjects, to which reference was made from various aspects,

between pneumoconiosis and lung-cancer, quoting

the interpretation of the results of animal experiments The relative advantages of the inhalation and injection

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a tendency to regard dusts as essentially of two kinds; the one, harmful, including crystalline free silica, asbestos and some others which produced serious effects, was constantly in mind; the other, including dusts which

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present He emphasized the importance of not overlooking the vast amount of information which came to the attention of physicians engaged in general and private practice

* v II, 203.

Two papers, submitted by Drs FROST and GEORG of Denmark, and by Professor ROSSIER of Switzerland, dealt with the value of functional and laboratory tests for disability In a lively discussion on the subject, Dr. FLETCHER enumerated the desiderata of a practical test; it should be objective (*i e*, independent of the subjective judgment of the observer and the desires of the subject), valid, specific, simple, sensitive, and related to normal controls. It seemed to be generally agreed that though reasonably accurate information could be obtained on pulmonary function, there are at present no physiological or laboratory tests which can be adapted in the field for routine examination of large numbers of workmen The maximum breathing capacity was probably the only simple and reasonably sensitive test for respiratory function available at present

The discussion on early diagnosis, differential diagnosis and clinical aspects did not bring to light any new methods It was emphasized that diagnosis must depend not on X-ray appearances alone but on the 3 elements an occupational history of adequate exposure to the dust, a physical examination showing signs and symptoms compatible with the disease, and a chest radiograph showing the characteristic pattern Professor GERNEZ-RIEUX believed that methods of diagnosis generally employed were inadequate In his unit a systematic tomographic examination was first performed Bronchoscopy and histological examination of biopsy specimens were also carried out, and thorough bacteriological examinations and agglutination tests where tuberculosis was suspected, a therapeutic test with streptomycin being sometimes added.

The sessions on dust investigation included consideration of the rates of settlement of dust of different sizes, various problems of drilling, the importance of very ... and the value

Requirements for the Appraisal of Dust Exposures (Professor T F HATCH) This last is a particularly important and interesting paper, in which are discussed the complex interrelations between several factors that characterize dust exposures and the resulting hazard The inadequacy of present methods of analysis is pointed out

In regard to preventive measures, the Conference ...

exposure Several references were made to the danger of sandblasting Though this was generally accepted as high, there was some difference of opinion as to the statement the Conference should make on the subject

BURG considered that, with the development of protective measures, the flat statement that such blasting was highly dangerous was not true in all cases. In the end these differing views were incorporated in the Report of the Conference Recommendations were made that the I L O should enquire into the possibility of controlling grain dust associated with the handling of cereal cargoes, that Governments, local authorities, contractors and others should have their ...

pneumoconiosis-producing industries and health authorities in the campaign against tuberculosis Many interesting papers were presented on aspects of prevention, including two from the I.L O. reviewing legislation and giving extracts from Laws and Regulations of different countries Professor E J KING

native employment ... but the provision of alternative employment should not prejudice the amount of his compensation

A proposal by United Kingdom members for a subsequent conference at an early date, to consider preventive methods from the point of view of the engineer, physicist and chemist, was unanimously adopted, as was a proposal by a United States member that the Office should prepare a directory of workers in the field of pneumoconiosis.

... speeches included a review of the Con... outstanding in ... simple definition ... and compen... conclusion that methods were now known which allowed adequate protection against dust, and the adoption of a trial radiological classification To the reviewer these volumes appeal as being a comprehensive source of up-to-date information on most of the important practical, and many of the theoretical, problems connected with pneumoconiosis There is a useful index. The report is not on sale and copies are not now procurable

A. T. Doig

BRITISH MEDICAL BULLETIN. 1950, v. 7, Nos 1/2, pp. iii+144, numerous illustrations **Part I: Industrial Hazards. Part II: Commentary. History. Documentation.**

* * *

The papers on the pneumoconioses include one on coal miners' pneumoconiosis by Dr C M FLETCHER and Professor J. GOUGH, on silicosis and other pneumoconioses by Dr E. L. MIDDLETON, and on byssinosis in the British cotton textile industry by Dr R. S F. SCHILLING In the first of these the well-known work of the Medical Research Unit at Cardiff is described, and the pneumoconiosis of coal workers is shown to be conditioned by the amount and kind of dust up to a certain limit of progression, and the occurrence of an infective element if further

diseases is shown to go far beyond the minerals containing silica and to include metals and metallic compounds and vegetable dusts In the third article the history of cotton workers' "asthma" is traced, and the results of research and investigation are recorded, the conclusion reached, however, is that more work is needed to clarify the aetiology of the disease and to ensure its prevention

* * *

E. L Middleton

JOTTEN, K W, KLOSTERKOTTER, W & PFEFFERKORN, G [Edited by] Die Staublungenerkrankungen

national Congress on Dust Diseases of Lungs, Institute for Investigation of Dust Diseases of Lungs and Industrial Hygiene, Institute of Hygiene of Westphalia—Wilhelms University, Munster, 2-4 November, 1953] pp. xxxv-424, 273 figs 1954 Darmstadt Dr Dietrich Steinkopff [DM 40]

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1953 The first Conference in the series was held in November 1949

The 46 papers submitted to the Conference cover the whole field of research on pneumoconiosis in a most thorough and up-to-date manner They are grouped under 4 heads pathology, the action of different dusts in animal experiment, fundamental research in the chemical, physical and mineralogical fields and in investigations by electron-microscopy, and clinical aspects of research including radiology, prevention by mechanical, physical and medical measures and the treatment of pneumoconiosis

Professor H GÄRTNER (Homburg/Saar) in an opening address (pp 3-16) reviewed the progress of pneumoconiosis since the previous German conference 4 years before He gave some figures of the incidence in Germany. The number of persons receiving compensation for industrial diseases for the first time, in 1951, was 9,306, over double the number for 1938, and of these 6,090 had pneumoconiosis; almost 5,200 were miners Of the 9,306 cases, 457 were fatal, 385 from pneumoconiosis and over half from tuberculosis. In the Saar the number of notified cases of pneumoconiosis rose from 146 in 1946 to 1,274 in 1952, 88 per cent of the patients were miners Tuberculosis was present in 40 per cent of those notified during the 5 years 1946-50. In 1952 the percentage of tuberculous cases was diminished in the Saar as in the Republic He referred to the discussions at the Sydney Conference on the solubility theory and to the results of researches on crystal structure comparing the effects of crystal lattice, fibrous and platy forms of silicates, and of the combinations of the contained atoms and their positions, on the
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tion, and fresh fracture of minerals The mode of action of silica on the tissues was discussed and the

quartz, all other minerals and the amorphous form of silica in diatomaceous earth induced growth of diffuse connective tissue He emphasized that animal experimentation must occupy the central place in aetiological research Referring to research in Germany and England on the influence of hormones on silicotic fibrosis he considered that this line should be followed up, less in connexion with therapy or prophylaxis than in regard to the problem of the influence of constitution, work in this direction was being done by BECKMANN at Bochum on coal miners He referred to the use of aerosols on dust clouds and by inhalation for causing aggregation and precipitation The practical possibility of ending the production of pneumoconiosis lay in the prevention of dust by the technician, who holds the solution of the problem

The Pathology of Pneumoconiosis W. DI BIASI (Bochum) submitted *Remarks on a Few Points on the Pathological Anatomy of Silicosis* (pp. 16-26). In opening the section on pathology he discussed 2 questions how dust reached the alveoli where alone it could cause silicotic changes; and where these
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cells or free dust, and at the roots of the lungs silicotic glands might distort the lymph channels, but not in the lung itself where new lymph vessels might be formed. The nodules caused by quartz differed from those due to mixed dust in that their borders were sharply defined from the surrounding lung tissue; small quantities of quartz could lead to silicotic changes when exposure had been prolonged. The "focal emphysema" of South Wales coal miners' pneumoconiosis was also known in the Ruhr, as circumnodular emphysema, and was considered to be an important factor in explaining the impairment of function. The work of GOUGH was referred to, as was also his method of using mounted unstained sections The importance of gross changes at the roots of the lungs in causing functional damage was emphasized as a result of study in recent years Evidence had been found at autopsy of severe silicotic changes in the glands at the hilum without change anywhere in the lung; such changes had been found in old men who had not been engaged in dusty occupations and these could not fail to be important to the respiration and pulmonary circulation, and they could lead to distortion of bronchi, bronchiectasis, chronic emphysema and strain on the right heart *To what extent and in what direction the observed* involvement of nerves in the fibrotic masses was important was not estimated.

Silico-Tuberculosis (pp. 27–50). G GERSTEL (Gelsenkirchen) considered the general pathology of tuberculosis in so far as it was important for explaining silico-tuberculosis, and special attention was given to the reaction of the body to infection. In regard to management the slow cicatrizing processes were not favourably influenced by sanatorium treatment and rest but antibacillary treatment was highly valued. In tuberculosis the personal factor was the important one; age reacted differently from youth, the susceptibility of young girls to tuberculosis after exposure to quartz dust was well known from the experience with the packing of scouring powders containing silica and alkali, and cases were reported from many countries It had been shown that the danger of silicosis was greater in families with a tuberculous history. The influence of physical build on the higher incidence of silico-tuberculosis was proved in several dusty industries when compared with that of simple silicosis, in the asthenic types the rates of silicosis to silico-tuberculosis was 13:1, in [illegible]

Saxony, in porcelain workers or in metal grinders in Solingen where the incidence of tuberculosis was more than twice that of the general population; in the mining towns of the Ruhr silico-tuberculosis was an important source of infection. The presence of tuberculosis was not necessary for the development of severe silicosis or for a fatal termination The pseudotumoral form was found in 73 per cent. of simple silicosis and in only 60 per cent. of silico-tuberculosis. A fundamental fact was established that the susceptibility to tuberculosis increased from the *commencement of* dust inhalation. The danger from *any dust* was *increased* with its free silica *content. New* questions had been raised through the modern therapy of tuberculosis and through the introduction of organic silica compounds. In conclusion the German Law relating to compensation *for* industrial diseases as applied to silicosis and tuberculosis *was discussed.*

Pneumoconiosis in a Feldspar Worker (pp 51–8) W ROTTER and H. GÄRTNER (Homburg/Saar) The case described was that of a *man, aged 53, who had been employed digging* quartzose feldspar in the open for 9 years with no dust risk; *afterwards he* was employed for 11 years at a machine grinding the rock, and, although exhaust draught was provided, *there* was a *definite* risk of dust inhalation He *developed* pulmonary tuberculosis and died. Examination of the lungs showed, besides the tuberculous lesions, scattered miliary or sub-miliary nodules of a large-cell granulomatous type which contained many amorphous grey or black particles 1–2 μ in diameter, and colourless double-refracting particles 1–4 μ in diameter The reticulin and collagen fibres were not, or only slightly, increased and there was no concentric arrangement in the nodules Similar particles were seen in large cells in the *lymph glands* in which the double-refracting particles were more sparse Rational analysis of the material showed quartz 45 4 and 38 3 per cent.; particle sizes were 40–45 per cent from 2 μ downwards Lung tissue extracted by the hydrogen peroxide method showed the residual dust to be of similar composition to the raw material but the kaolin lines were stronger in the lung material, by X-ray diffraction, probably owing to a higher concentration in the air-borne dust cloud Electron-microscopic examination of the lung dust showed mineral particles from 3 μ downwards; many were under 1 μ and some were in aggregates Whether the changes found here should be called modified silicosis or silicatosis was open to question, but the silicate feldspar certainly had played a part in the histogenesis of the lung changes, the quartz being restrained in its action; the sharp distinction between this and true silicosis due to quartz seemed artificial.

Morphology of Pneumoconiosis in Pottery Workers in Upper Franconia (pp 58–64) E. KIRCH (Wurzburg). The author described the results of 136 autopsies on porcelain workers. In three-fourths of the severe cases of simple pneumoconiosis tumour-shaped masses were found about the size of a fist; in the remainder the masses were smaller They were almost always multiple and in several lobes, the upper lobes being chiefly affected In typical cases the lungs were pigmented with a greenish or bluish colour and a metallic sheen; the lymph glands were similarly affected, and enlarged Cavities were frequently present in the fibrotic masses even in the absence of tuberculosis By histological examination the structure of the masses showed an irregular arrangement of fibres, and deposits of dust. Besides the larger masses there were numerous smaller

nodules surrounded by a thick layer of macrophages. Numerous nodules composed of aggregations of dust cells were found throughout the lungs, especially in air-containing parts, the appearances suggested actively progressive changes long after exposure had ceased. Chronic bronchitis and bronchiectasis were frequently found; emphysema was present in almost all cases, sometimes of bullous type, thickened pleura was more frequent than in other forms of silicosis Tuberculosis was present in 91 of the 136 cases and 62 of these also had severe silicosis; in most cases the tuberculosis was of an active caseating type Later investigations seemed to indicate that the proportion of cases of pneumoconiosis and of combined tuberculosis had improved in the period after the war. The pneumoconiosis of porcelain workers appeared to be of a special form

Functional Anatomy in Pneumoconiosis (pp 64–70). H v HAYEK (Vienna) Professor von Hayek described the minute anatomy of the lungs in relation to the reaction to the presence of dust. He found at 3 sites morphological changes of the epithelium which were important 1, in the narrowest part of the air passages where the bronchioles played an important part in dust retention, 2, at the apertures in the alveolar walls where the alveoli open into the interstitial spaces, 3, in the alveoli which are situated [illegible]

oxygen, the third was used as control After half-hour treatments on 14 days the lungs of the animal receiving increased oxygen appeared clear and those of the animal receiving CO, and reduced oxygen were deeply blackened compared with the control It could [illegible]

given of the case but a description of the method of cleaning the gas, and analyses, are given. The percentage of silica in 3 dust samples ranged between 10 and 16, the free silica in the fraction under 5 μ was 1 8 and 2 6 per cent in 2 samples; the percentage of iron in 3 samples of the dust ranged from about 19 to 40 In the discussion H. SYMANSKI

[illegible]

siderosis or silicosis

The Action of Different Forms of Silica in Animal Experiment (pp. 73–84). W. KLOSTERKÖTTER (Munster). In animal experiments the difference between short-lived animals and long-lived man must be taken into account; higher concentrations of dust must be used in experiments on animals to compare with the long exposure of man to dust. Experiments, carried out in association with K. W. JÖTTEN between 1951 and 1953, were made by intratracheal, and in some cases by intraperitoneal, injection or by prolonged inhalation The experiments included injection of silica solution, silica colloid, silica gel and silicates of various constitution Doses of 50 mgm of dust of size 0·5–3 0 μ, suspended in physiological salt solution, were used by the technique of KETTLE and HILTON. Details of the experimental procedure and the results obtained were fully described and 12 photomicrographs illustrate the tissue changes Solutions of molecular silica in low concentration showed no injurious tissue reaction. Colloidal amorphous silica was found to be a tissue poison, the fibrogenic action was not of typical nodular form. The reactions to the other forms of silica were proportional to the molecular structure; with pure silica gel the reaction was *practically* negative, with partly crystalline opal it was moderate, with the chiefly crystalline flint it was greater, and with pure crystalline quartz it was maximal [illegible]

shown. Theories of surface action were discussed. According to the author's experimental *results* the fibrogenic action was not proportional to the ammonium molybdate fraction, rather was the reverse the case, the estimation of the molybdate fraction of silica, therefore, should not be the basis [illegible]

[illegible] silicates the slight pathogenic action of potash feldspars, in spite of their lattice *structure*, must be linked with the presence of the Al *atom*. The *silica* tetrahedra in the mineral hornblende were in chain form; that fact and the screening effect of Al and iron should render it harmless There was at present no theory of silicosis which was satisfactory in all details.

The Pathological Action of Different Mineral Dusts in Experimental Animals (pp 84–95. E. J. KING (London) and G. NAGELSCHMIDT (Sheffield). Profes-

sor King reported on many experiments devised to elucidate the theory of silicosis. Most of the experiments described had been published previously, and they were collected and discussed here with special reference to the solubility theory, the influence of crystal structure, particle size and surface area, and the effect of age or weathering of minerals on their action on tissues. From experiments with amorphous silica, quartz, cristobalite and tridymite it seemed proved

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fibrosis. Experiments made with flint dust in 5 grades of fineness (under 0·5–8 μ) gave a fibrogenic response inversely proportional to the particle sizes. With a constant area of the particles (700 cm² per rat), *the optimum fibrogenic action was in the size* range 1–4 μ, above or below this the action was less, especially with the larger particles. Experiments were made with aged or weathered dust; by removing the easily soluble surface layer by repeated extraction with Ringer's solution the solubility was reduced to 1/10th of the original solubility, but the fibrogenic action was the same as with the untreated dust; when treated with hydrofluoric acid this residue *with low solubility showed considerably increased* activity, due probably to adsorbed fluorine ions and damage to the crystal lattice structure. The ideas about silica solubility and its connexion with tissue changes must be modified because solubility is a function of specific surface area; the greater the surface area the greater is the fibrogenic action, but greater also is the solubility. A possible mechanism of the origin of silicosis was presented: dissolved

polymerized and tissues; in its newly ; the silica particles must be so small as to be dissolved sufficiently, and large enough to remain for a prolonged period of time in the tissues; the prolonged irritation was responsible for the continual formation of colloidal silica for the building up of fibrotic tissue in the silicotic nodules. The tissue changes produced in the lungs of the experimental animals by the *different forms of silica* and periods of exposure are shown in 15 photomicrographs; the intense fibrosis produced by tridymite in 5 months is particularly *striking. Commenting on the paper,* LUCHRATH (Bonn) reported on experiments which yielded similar results; he described early necrotic change in the nodules with *tridymite*.

The Peritoneal Test (pp 95–105). C. VAN MARWYCK *(Munster)*. *After* a short review of the literature the author described a series of experiments which he *had carried* out by this method on mice, using quartz, kaolin, gypsum and aluminium phosphate. He found, in agreement with RUTTNER, that

quartz dust but also with other dusts which had hitherto not been shown to produce a fibrogenic action in the lung tissue, for example, kaolin. Various types of silicosis nodules were described of which the smallest, with a diameter of about 1 mm., showed the typical structure; with quartz these were by far the most numerous. The time factor was important; in animals killed at the end of 5 weeks the results were most significant. The significance of the peritoneal

Aluminium phosphate showed a slight fibrogenic action. As a secondary finding, nodules in the liver showed the typical structure of silicotic nodules and were found only where quartz was used. Photomicrographs show tissue reactions to dust; a diagram of *X-ray diffraction spectra* of quartz and aluminium phosphate shows the similarity of the lines.

The Tissue Reactions to Mineral Dusts in the Mouse Peritoneum (pp 106–11). J. R. RÜTTNER (Zurich). The question to which answer was sought was: were there, apart from quartz and its modifications, other minerals which caused a fibrogenic action? The author discussed a few important points and summarized general results from previous *experiments*. *(1) Fibrous nodules were produced in* the peritoneum, but not only by quartz, whose action was not absolutely specific. (2) Similar tissue reactions were brought about by (a) the crystalline modifications tridymite and cristobalite; (b) certain silicates, *e.g.*, kaolin, and partly also by feldspar; (c) silica-free minerals, *e.g.*, beryllium oxide, and aluminium with or without stearin coating. (3) Crystalline modifications of carbon—graphite and diamond—possessed a fibrogenic action in a certain measure which was, however, considerably less than that of quartz. (4) There were minerals like corundum and hornblende asbestos which proved to be inert under the experimental conditions and pro-

mine dusts. The tests consisted in studying the peritoneal and glandular reactions of rats, 1, 2 or 3 months after injections of sterile suspensions, in physiological salt solution, of 100 mgm. of dust of 2–3 μ or under. *The authors maintained the value* of the peritoneal test against the pulmonary *route* on the ground of its rapidity and simplicity; cells and tissues reacted in the same way whether pulmonary or peritoneal; intratracheal injection of dust suspensions was not comparable with inhalation *of* dry dusts. *The results of these* 1,200 tests were described: (1) large nodules, 4–10 mm., few in number with a necrotic centre surrounded by concen-

... have not specific lesions; (2) small ... or fibrous re- ... nocuous, (3) ... of a miliary ... and partly fibrous, indicated noxious dust; (4) spherical nodules, 3-4 mm, hard, homogeneous on section and predominantly fibrous, *indicated noxious dust*, (5) tracheo-bronchial glands unmodified, showing microscopic particles without cellular or fibrous reactions, *innocuous* dusts; (6) tracheo bronchial glands hypertrophied, showing increased cellular masses more or less altered and sometimes fibrotic, noxious dusts Photomicrographs show the effects of experimental dusts on the mediastinum Considerable discussion followed this paper

injected into the anterior chamber; Aerosil (99 per cent amorphous silica) corundum, quartz treated with lime water and sulphonated phenol, and calcium carbonate In conjunction with quartz calcium carbonate did not check the fibrotic reaction Photomicrographs show the tissue changes produced by silica.

Phagocytosis of Industrial Dust in Tissue Culture (pp 128-9) E SCHILLER (Homberg/Niederrhein) A film was shown in which the phagocytosis of quartz, diamond and tremolite asbestos in lung cultures of mice 3 days old could be seen As BELT, FRIEDMANN and KING had shown, asbestos dust was only slightly phagocytosed. Phagocytosis of quartz caused severe injury to the cells, as described by POLICARD, ...

tests are given

The Conditions of Chemical Reaction of Quartz Dust in the Organism in Silicosis (pp 130-42) L HOLTZAPFEL (Berlin) This dealt with the biochemical reactions connected with the development of ...

mary the first powerful chemical reaction of dust ...

turbance of the normal ferment system, and with this the silicic acid components could, through reciprocal action with oxygen, alter the normal course of reaction.

actions which took place between quartz particles and the tissue components in producing the pathological changes characteristic of silicosis. In one of the experiments on phagocytosis a protective effect was shown by vitamin B1 and a laboratory compound, a condensation product Photomicrographs show sections of nodules from mouse mesentery, one from an unprotected animal showing fully developed fibres; the other, from an animal treated with vitamin B1 in the food, showed cellular structure with few fibres It was not suggested that vitamin B1 or the condensation product, with the research number Jg25, were prophylactics of silicosis, but the experiments seemed to point the way to further progress.

The Physical Chemistry of the Quartz Surface (pp 160-65). (The water layer on the quartz surface and its influence on adsorption) L MILLER and W. STOBER (Gottingen) The authors brought forward consideration of the surface water layer as a factor in addition to those connected with the free valences ...

tatively the water layer on quartz by a thermal method, by means of an apparatus which is illustrated by a diagram The experiments were made on 3 types of quartz with different surface values. The possible value of these experiments for silicosis research was discussed

A New Technique for Measuring Reactions at Quartz and other Surfaces (pp 165-71) E V. SMITH and J A WADDAMS (Wolverhampton) This is a description of experimental work being carried out at the Wolverhampton and Staffordshire Technical College The study of interactions at the surface of dust particles was complicated by such factors as particle size, pretreatment, dust/reaction-fluid ratio, etc, and a programme of work was commenced at Wolverhampton on macro surfaces ...

individual techniques were described

with the use of a water-free formamide, which is used in industry and can be obtained easily The process involves heating with formamide for long periods at temperatures at first not exceeding 100°

of the blood was estimated by causing the patient to [illegible] mixture deficient in oxygen for 5 minutes [illegible]

was much delayed. An apparatus was described which incorporated this principle.

Egg-Shell Calcification of Hilar Lymph Glands without Silicosis (pp. 303–9). G IRMSCHER (Berlin). After a review of the literature 4 cases were described, and illustrated by radiographs One of the patients was a man 63 years of age who had no dust exposure before the first signs were found; for 2 years afterwards he was exposed to dust but no silicosis was found. The second, a man of 35, had no exposure to dust and the condition at the hila was found when he was under treatment for bronchopneumonia The third man, aged 56, had spent 40 years as a mason workı ıg on marble, granite and sandstone; calcified glands were found at the roots but no silicotic changes were found in the lungs The fourth case was that of a woman, aged 50, who had been employed for 3 years (1917–20), packing scouring powder and had been treated for 7 months at Davos in 1941–42, a radiograph taken there shows scattered haematogenous tuberculous lesions in both lungs; a radiograph taken [illegible]

twins, of these 28 pairs were uniovular twins and [illegible] pairs bino[illegible] sis among [illegible] and only [illegible] binovular [illegible] and 12 t[illegible] lesions in [illegible]

Radiolog[illegible] (pp. 312–[illegible] men empl[illegible] the oldest [illegible] ment, were selected for examination, of these 8 showed changes due to dust, all of them classified as stage I, except one whose history with pure graphite was uncertain X-ray diffraction analysis of the graphite did not show the presence of quartz

Measures taken in the Ruhr Mines for Suppression of Dust and Prevention of Pneumoconiosis (pp 313–25) K. SCHULTE (Essen) The author outlined the methods used for suppressing dust and described dust conditions and the incidence of pneumoconiosis at particular points. He stressed the seriousness of the disease to the mining industry in the Ruhr and referred to its cost. He dealt with the questions which arose in dust measurement where, how often and for how long sampling must be done; the apparatus to be used; concentration, composition and particle size. The instruments used were the tyndalloscope (Leitz) the mine konimeter (Sartorius) and a projection microscope (Leitz). Examples were given [illegible]

spraying and aerosols were used; a new form of exhaust for drilling was used dry, in view of the increasing depth of the mines, and water-infusion under pressure was referred to

New Experimental and Practical Results in Dust Aggregation with Sodium Chloride (pp 325–39) L DAUTREBANDE, H. BECKMANN and W. WALKENHORST (Bochum). The mathematical and physical theories on the use of aerosols in dust clouds were discussed The various factors for the aggregation of dust particles were mentioned atomization of the salt solution, the concentration of salt in the air, the [illegible] The [illegible] in experimental tests carried out underground in a coal mine were described. As a result of the studies it was seen that in the atmosphere underground aggregates were formed between the dust and the salt aerosol This qualitative result must be followed by quantitative experiments so that it may be possible to diminish the amounts of the dangerous fine dust particles.

Physico-Chemical Properties of Natural and Artificial Aerosols (pp. 340–51). H CAUER (Bochum-Hordel) The author discussed the theoretical properties and behaviour of particles and the immediate conditions which influence them under various atmospheric conditions, and referred to the reasons for failure of wetting agents hitherto, either because of the apparatus used for producing the aerosols or the wetting agent being more or less injurious to health Now a suitable apparatus was available for use in coal mines, and a suitable wetting agent which was free from risk to health could be used Experiment with these had begun but had not proceeded far enough to enable results to be described.

On the Question of Aerosols for Prevention of Silicosis (pp. 351–4) H. KLUMB (Mainz) Professor Klumb referred to the substances formerly used as [illegible] and to [illegible]

Unipolar-Charged Aerosols in the Lung Tissue in Chamber Inhalation (pp. 354–60). N. NEYMANN (Bochum-Hordel) With VON CAUER the author carried out experiments with Wiesbaden-spring water, mixed with other materials Colloidal silver of particle sizes 1/1000–1/10 μ was dispersed in the water, the animals used were rhesus monkeys, dogs and guineapigs; inhalation lasted 2 hours in the case

of the monkeys and longer in the other animals. Histological sections, of which illustrations are given, showed that the unipolar-charged colloidal silver had reached all parts of the lung, uniformly, in all directions.

... (pp 360-

on precipitation of dust, and could combine medical prophylaxis

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sisted of a face-m...,

pressed-air source, the air supply could carry up to 50 face-masks and provided pleasant, cool air It had been used for coal miners and for furnace bricklayers

carefully the development of s... clinical and radiographic methods and referred to complications arising from affections of the bronchi and the circulatory system. The difficulty of assessing the value of prophylactic and therapeutic measures was increased by the great variety of factors which had to be taken into account Causal therapy for ... not possible in spite of much experi-

The results with soot were ... preparation of a calcium compound of extreme fineness was not found to produce comparable results, doubt was therefore cast on the efficacy of aerosol therapy which depended on the penetration of the particles into the tissues The various methods and types of apparatus for administering aerosols were

could be treated by rest and chemotherapy a... course thus favourably influenced though the improvement might not be permanent Much more controlled research was needed on the treatment of silicosis and silico-tuberculosis.

First Results of Aerosol Prophylaxis with Aluminium Hydroxide (pp 385-9) P. Zeglio (Turin) A method was described of administering a mixture containing 2 per cent aluminium hydroxide in gel form, with hyposulphite, benzoate and paraminobenzoate of sodium, and an alcoholic solution of an essential oil, to 400 workers employed in a stoneware pottery and 2 steel foundries The workers were willing to have the treatment and only 2 were excluded, on account of headache. The author's personal impression was favourable; lowering of the incidence of common colds was noted and was probably due to the balsamic antiseptics in the

industries ... asbestos manufacture

... (pp 399-403) K. Bisa (Klos-

selves, gave evidence ... composition of the aerosol used was given and the mode of administration was described

of silicosis

Apparatus for Administration of Aerosols and Broncholytic Therapy with Remedies of the Adrenaline Series (pp 413-18) H Friebel (Bonn) The author discussed the dangers which might arise in the treatment of silicosis, especially with the use of certain drugs owing to side effects, and referred to inaccuracy of dosage when used as inhalants with some types of apparatus He referred to new apparatus which was being developed

It is possible in a review of a work such as this to note only a few of the many points in these scientific papers, all of which are concise summaries of mu... report... mater... ence, ... were ... Belgium, England, France, Italy and Switzerland All the papers and the discussions are in the German language, with the exception of one paper which is in French

The paper is essentially one for research workers and it should be made readily accessible to all those engaged in this field *E L Middleton*

INDUSTRIAL HYGIENE FOUNDATION OF AMERICA Pittsburgh 19th Annual Meeting held at Mellon Institute, Pittsburgh, Pa, November 17–18, 1954. **Transactions of the General Meeting and the Conferences—Medical, Legal, Joint Medical-Legal, Chemical-Toxicological, Engineering.** 241 pp, numerous figs [Numerous refs] 1955 *Trans Bull No 28* [$2 75]

The Industrial Hygiene Foundation of America is a Research Association of Industries for advancing industrial health and improving working conditions At the General Meeting, after an address of welcome to the delegates given by E R WEIDLEIN, President

brief

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past year 25 environmental surveys or medical audits had been made by the Foundation's staff in 81 plants These included investigations of specific problems such as dust and fume, radiant heat and noise, the potential hazard being determined and controls recommended In

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laboratory, a

on normal lungs and on the development of tuberculosis; further investigations were being carried on to determine the pulmonary response to a variety of materials. Publications include a monthly Digest, the Transactions of Annual Meetings and conferences and reprinting of technical papers by staff members,

in industry.

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on intravenous injection Intratracheal injection of very finely divided material in aqueous suspension has often been followed by a high mortality rate, whereas equal or greater weight of the same material,

perly be related to the physical state, rather than to the chemical composition, of the injected material, unless there is convincing evidence to the contrary The subject of pulmonary dust retention is discussed, with references to recent literature. Definite data on the pulmonary clearance of ultra-fine particles are lacking One implication in the present interpreta

when colloidal silica was injected intratracheally; the soundness of the conclusion is questioned

* * *

The Engineering Conference contributed 5 papers. The first of these was by B P. WALLACE on *Physico chemical Dust Suppression in Final Products* The products dealt with were pulverized hard coal tar pitch, which is used as a mould and core binder in ferrous castings, pulverized bituminous coal, used *in iron foundries as a parting powder for sand moulds*, mixtures of these powdered products with dry, pow-

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off, a fourth method, is by causing clumping by a very strong static charge on all particles

B R SMALL submitted a paper on *Heat, Mist and Noise* *A new screw machine products plant*, which contained machines operating at a high noise level, was taken to illustrate the methods of construction which effect suppression of noise, control temperature and remove mist. These were fully described and illustrations are given. Costs of the methods described are compared with those of conventional methods and show an advantage over the former

W F FARAGHER, in a paper entitled *The Rôle of Oxidation Catalysts in Air Pollution Control*, explained catalytic oxidation in rendering gaseous contaminants *innocuous in air effluents* If the pollutants are completely oxidizable to water and

[illegible]

on the surface of the coated sticks; the catalyst is effective only with organic or combustible materials The Oxycat permits oxidation at temperatures far below those necessary for simple incineration Oxycats are arranged, in the number established by a pilot plant testing, in a suitable housing or chamber The possible applications for this device are described, they include treatment of effluents containing solvent vapour, and exhaust gases from internal combustion engines, a unit designed for automobiles using leaded petrol has been developed.

H E. Kiewig submitted a paper on *Outdoor Ventilation for Particular Industries by Open Plant Con-* [illegible]

efficient operating quarters Certain shortcomings in applying the principle are recognized and, on the other hand, examples are given where operations could be adopted to outdoor construction with advantage

The last paper was presented, in summary, by [illegible]

of efficiency tests were presented, along with a technique for determining the efficiency of a manifold sampler in an actual plant test

This report is well worth study by all who are interested in recent research on questions related to occupational health and safety, and also by those who are responsible for maintaining the relations between management and workers which are necessary to promote the best interests of both Incidentally, it throws an interesting and instructive light on the American scene *E L Middleton*

Gordon, D **Dust and History.** *Med J Australia* 1954, July 31, v 2, No 5, 161–6.

The main part of this paper consists of a review of the history of dust diseases, with a number of [illegible] Diodorus [illegible] figures [illegible] Queens- [illegible] 's com- [illegible] among

miners fell from 238 in 1921–22 to 27 in 1951–52. The annual incidence is now 4 or less per 1,000 coal and metal miners *Charles Wilcocks*

Worth, Gunther & Schiller, Erich. **Die Pneumokoniosen. Geschichte, Pathogenese, Morphologie, Klinik und Röntgenologie.** [The Pneumoconioses History, Pathogenesis, Morphology, Clinical Findings and Radiology] pp xxiv + 898, numerous figs 1954 Cologne: Staufen-Verlag K G, z Zt. Kamp-Lintfort, Postfach 46 [DM 178 50]

In this most comprehensive treatise on pneumoconiosis the method of treatment is on the basis of published work on the subject It is divided into 2 main parts, the first, by Erich Schiller, includes the history, pathogenesis and morphology, the second part, by Gunther Worth, deals with the clinical and radiological aspects The method of setting out the work is well suited for reference In the Table of [illegible]

is a Subject Index

The subjects cover all the medical aspects of pneumoconiosis The study begins with a historical survey of the literature on pneumoconiosis, with references to prehistoric, Greek and Roman times and the Middle Ages An interesting and artistic account is given [illegible]

of free silica, and of the theories related to such subjects as sericite, solubility, activity of the particle surface, and the piezoelectric theory. The research institutions devoted to the subject in different countries are briefly described

The normal anatomy of the respiratory apparatus is described in a systematic study This includes macroscopic examination of the upper respiratory tract and the lungs and includes references to comparative anatomy of animal species Microscopic examination deals with the mucous membrane of the whole tract, the peribronchial structures, the divisions of the bronchioles, and the alveolar system which receives detailed description, special attention being given to the epithelial cells, their functions, changes of form, phagocytic action, the occurrence of alveolar pores and the cellular adaptations which control them Similarly detailed descriptions are

given of the pulmonary blood vascular system, the lymphatic system and the nerves of the lungs

A very complete survey of the literature on the physical and chemical properties of industrial dusts forms an important and valuable part of the book. Here the physical conditions which influence air-borne dusts are examined, methods of dust sampling and examination are dealt with in detail, and also theoretical considerations of surface action, specific-weight of silica-containing minerals, the rate of fall of particles, brownian movement, agglutination and electrical charge The optical properties of particles and instrumental methods used in their examination are discussed, with special chapters on electron microscopic examination of dusts, and on the chemical properties of dusts in relation to the theories of solubility, adsorption and chemical combination as surface phenomena This section leads to the study of the behaviour of dust particles in the air passages, the nose as a filter, and measurement of dust retention in the tracheo-bronchial tree and in the alveoli.

A section on experimental pathology and pharmacology will probably be most valuable to experimental workers, dealing as it does with tissue cultures and phagocytic reaction to many kinds of dust particles, animal experiments with different species and methods of experimentation by dust inhalation, intratracheal injection and insufflation, subcutaneous, peritoneal, pleural, intravenous, lymphatic and thecal injection, and intracorneal inoculation. The first part of the book is concluded with a full account of the morbid anatomy of pneumoconiosis resulting from different industrial exposures Changes caused by dusts in organs other than the lungs are described, and this very important section ends with studies of the complications of pneumoconiosis, notably tuberculosis and new growths

The second part of the book begins with a study ... pneu- ... which ... out ... adio- graphs used in different countries ... regard ...

... The bronchograms are patho- ... and destruc- ... d angiograms ... monary blood ... are studied ... nchial spasm, ... fferent types, ... nd lymphatic glands, abscess and cancer. Infrequent complications include silicosis of the spleen, nephrosis and amyloid disease. Tuberculosis accompanying silicosis receive extended examination which includes statistics o frequency and mortality, and the incidence in different industries, clinical features and specia forms and complications of silico-tuberculosis

The pathophysiology of respiration, heart and circulation in silicosis forms a long and important section. It deals with the literature on the measurement of the effect of silicotic change on these functions as indicated by many recently introduced instrumental methods The development, course and prognosis of silicosis are described and details are given of extensive investigations in various occupational groups Personal factors are then examined: constitution, race, twins, blood-grouping, nutritional state and other factors. This section is concluded with studies of therapy for treatment and for prevention of dust inhalation by agglutination of air-borne dust, and the inhibition of fibrotic change with the inhalation of aluminium and calcium dusts, and with the use of hormones, and the relief of symptoms by drugs as aerosols The medical supervision of workers exposed to the risk of dust inhalation is referred to and certain official German rules are quoted The various industrial groups in which pneumoconiosis occurs are fully examined, the occurrence of acute silicosis in 14 industrial processes is discussed. The nature and prevalence of mixed dust lesions in a variety of occupations are described and illustrated with many radiographs

...

duced in the human lungs by dust of talc and kaolin are described Among dusts which contain no free silica, aluminium, barytes, beryllium and chromate are described Other lung changes described in this section include those due to soot, the siderosis found in non-ore workers, welders and boiler-scalers, and changes due to tin oxide, vanadium pentoxide, Thomas's slag, manganese, fumes from cadmium, ... and the ...

... includes discussions of flour or meal dust, which is ...

... origin

The last section deals with the differential radiological diagnosis of pneumoconiosis from other diseases of the lungs, it contains many radiographs The lung changes described include the fine stippling of miliary tuberculosis—acute, chronic and calcified; Boeck's sarcoid; miliary carcinomatosis, miliary leukaemia and lymphogranulomatosis; affections of

the bronchi and bronchioles; disseminated syphilitic lesions; circulatory conditions; cysticercosis, and certain degenerative conditions Among the coarser shadows which have to be distinguished are changes due to atelectasis, infarct, unspecific infiltration, abscess, cysts and actinomycosis Many conditions producing enlargement of the hilar shadows and broadening of the mediastinum, due to inflammatory processes, new growths and lesions of the mediastinal viscera, are also to be distinguished from changes produced by dust

This treatise appears to contain references to all the published work on pneumoconiosis from the earliest to the most recent times It should prove of the greatest value to research workers, and to teachers and advanced students in the medical aspects of this

MEREWETHER, E R A **The Pneumoconioses—Bricks in Search of an Architect.** *Arhiv Hig Rada* Zagreb 1953, v 4, No 3, 365-82

The author gives an interesting survey of the problem of pneumoconiosis and its historical background The magnitude of the problem is illustrated by recent figures relating to the incidence of the pneumoconiosis in Britain In 1951 there were 1,300 deaths from one or other form of pneumoconiosis In the same year 5,250 people died as the result of traffic accidents, while 11,631 died from tuberculosis When these figures are compared with the respective populations at risk, the magnitude of the pneumoconiosis hazard is obvious It is widely known that silicosis is often accompanied by tuberculosis Recent figures show that out of 2,407 deaths from silicosis, tuberculosis was a complicating factor in 48 6 per cent Of 296 workers who died from asbestosis, 16 per cent had primary lung cancer Of 6,884 cases of silicosis, at post mortem 91 (1 3 per cent) had cancer of the lungs or pleura *Thomas Bedford*

HASSELT INSTITUT D'HYGIÈNE DES MINES Communication hors série Le problème des poussières en hygiène du travail [LAVENNE, F] 1953, 52 pp , 13 figs **[Dust Problems in Occupational Hygiene]** (2 on 2 pls) [Reprinted from *Rev Questions Sci* 1953, Ser 5, v 14]

This excellent paper constitutes an impartial review of the medical and technical problems relating to pneumoconiosis

The first part consists mainly of a medical section to which is added a very brief legal section The second part concerns the technical aspect and contains sections on (1) the measurements of dust concentrations, (2) methods of dust suppression, and (3) dust suppression in coal mines

In the second of these the discussion is mainly, and in the third it is entirely, confined to current Belgian practice

This paper should be of great interest to non-specialists Lack of a bibliography is unfortunate. *John McK. Ellison*

KING, E J , WYNN, A H A , NAGELSCHMIDT, G. & COCHRANE, L A **Pneumoconiosis in Germany.** *Ministry of Fuel and Power Safety in Mines Research & Testing Branch Res. Rep No 10.* 1950, May, 31 pp

This is a report by a team of experts on their visit to the main German research centres engaged on work in connexion with pneumoconiosis, and attendance at and participation in the pneumoconiosis Congress in Munster in November 1949 The report consists chiefly of a concise statement of facts and impressions and is itself in the nature of a summary, which should be read in full , a few of the items of information may be mentioned here

cases each year in the Western Zone , approximately 80 per cent are among coal miners In Germany the pneumoconiosis of coal miners is officially believed to be due to silica, but X-ray pictures of Ruhr miners are similar to those of South Wales

under 10 years, are excluded from underground work and are transferred to work under approved conditions , some with severe disease are also allowed to continue similar work The administrative arrangements for workers' compensation are described. The methods of keeping records are commended by the team for consideration in Great Britain In the Russian Zone there is compulsory examination of all new entrants and annual periodical examinations, and X-ray examinations once every two years, of all miners working above or below ground , affected

the extent of 70 per cent. ; the use of dust traps of two types ; sprays, water infusion and road consolidation for which common salt is used. Stone dusting is done only with approved dusts, usually limestone and gypsum.

Research institutes have been rebuilt and re-equipped, and research was beginning on a greater scale than in Great Britain. Of three main research institutes two, at Munster and Bochum, are already complete, and one at Bonn was under reconstruction, the first is financed by the State, the others are research institutes of mine owners and other employers. Besides these three main institutes research was carried on at a number of universities and institutes in Berlin, Frankfurt, Harsewinkel, Bad-Hamm and Göttingen Various methods and lines of research are described, such as electron microscopy, X-ray diffraction, physical properties of rocks, measurement of dust concentrations, prophylactic dusts, and radiological and clinical aspects of silicosis The clinical picture played a more important part in the diagnosis of silicosis in Germany than in Great Britain Biochemical research on pneumoconiosis was regarded by the visiting team as an [illegible] harmless

Other pulmonary diseases mentioned include cancer due to chromate dust, and in the uranium mines in the Russian Zone, fibrosis from exposure to fumes from electric furnaces used in corundum manufacture, lung disease due to talc dust ; and to pumice in leather dressing, and radiographic changes, without disablement, from barium sulphate dust.

Two appendices to the Report reproduce German official circulars to colliery administrations on the control of dust in coal mines, and the examinations and selective employment of miners

E. L. Middleton

SMITH, G C **Occupational Factors in Pulmonary Dust Disease.** *Med J Australia* 1950, Nov 25, v 2, No. 22, 777–82. [37 refs]

This is a general treatise on current views and [illegible]

dust containing about 25 per cent. of free silica, pneumoconiosis has been found in these workers

A long period of exposure seems necessary to produce disabling pneumoconiosis in coal miners exposed to dust in which the fraction under 10μ contained 1·8 per cent of free silica At breathing level about 5 per cent of coal-dust particles, and only about 1 per cent. of sandstone particles, are over 5μ in diameter The average period of exposure of coal miners with disabling pneumo[illegible] second time being a few weeks after he ceased excavating work) and again in 1942, 17 days before he died, only on the last radiograph were signs of bilateral nodular fibrosis reported. At autopsy [illegible] was installed

Dust from basalt rock was apparently the cause of generalized fine mottling in the radiographs from two men after 15 years' crushing, and 35 years' crushing and screening work, respectively ; the former was totally disabled, and his radiograph showed [illegible] operators from 14 other theatres, the period of employment ranged from 7 to 37 years, some of them in badly ventilated booths

Bagasse (or megass) is of interest to Australians because of their sugar industry ; no mention is made of a fibre-board industry or of the occurrence there of bagassosis

E L Middleton

MARCHAND, M. Les pneumoconioses non sclérogènes. **[Pneumoconioses without Fibrosis]** *Arhiv Hig Rada.* Zagreb. 1953, v. 4, No 3, 402–27. [237 refs]

The avowed object of this article is to bring some order into the vast tableau of those pneumoconioses which are not associated with pulmonary fibroses All dusts are more or less injurious, depending upon their nature and amount ; no dust is really inert if in excess.

Size is always important since particles more than 5 microns in diameter cannot get down into the pulmonary alveoli. The construction of the upper air passages decides why some persons are less prone to dust-damage, as the particles are caught there instead of penetrating deeper down.

First, the fibrosis-causing dusts are dismissed, including those consisting of silica, wholly or in part. The presence, if any fibrosis develops, of some per-

cough and cotton-strippers' asthma, generically named byssinosis and here surnamed allergoconioses, including cannabiosis and bagassosis. [Adding the suffix "osis" does not seem to introduce any order, but readers will be grateful for the excellent list of references.] *E. L. Collis*

Hounam, R. F. Some Colloidal Properties of Inert Dusts. *Arch. Indust. Hyg. & Occupational Med.* Chicago. 1952, Apr., v. 5, No. 4, 375–86, 4 figs. [12 refs.]

various dusts are listed. The effect of aluminium powder and aluminium sulphate on silica sols in water, and the properties of coal dusts in 50 per

the dusts used, it is suggested that the toxicity of inert dusts may be related to their negative charge dispersed in water. *J. McK. Ellison*

Hounam, R. F. Some Reactions between Inert Dusts and Proteins. *Arch. Indust. Hyg. & Occupational Med.* Chicago. 1954, Apr., v. 9, No. 4, 284–90, 4 figs.

In an earlier paper [see this *Bulletin*, 1952, v. 27, 942] the author investigated the titration of various dust suspensions against dye solutions. In the present paper the coagulation of dust suspensions by protein solutions has been investigated. The proteins used

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Proteins
of the other group reacted with positively charged dusts, but led to improved stability with negatively charged dusts. The amounts of methylene blue, gelatin

stabilities were assessed on an arbitrary scale. These results are described in detail. The properties of aluminium powder, used in the treatment of silicosis, are discussed.

On the assumption that the fluid bathing the lung alveoli has properties similar to blood serum (one of the proteins in the skimmed milk group) it is suggested that positively charged particles may be expected to cause coagulation in the alveoli, whereas negatively charged particles will induce no reaction with the lung fluid, but may be transported by its circulation to a site where they may cause coagulation. *D. E. Hickish*

Roach, S. A. A Method of relating the Incidence of Pneumoconiosis to Airborne Dust Exposure. *Brit. J. Indust. Med.* 1953, Oct., v. 10, No. 4, 220–26, 2 figs. [18 refs.]

In attempting to relate incidence of lung disease to dust exposure, it has sometimes been the practice to compare the incidence with the concentration of dust in the air to which groups of men have been exposed for similar periods. In other investigations, allowance has been made for differences in duration of exposure by comparing the incidence of disease with the product of the concentration of dust in the air and the duration of exposure; thus reference has been made to the number of particle-years of exposure. If the exposure calculated on this latter basis is founded on accurate knowledge of the dust concentration throughout the period under consideration and of the duration of exposure, this method of expression may be expected to be related to the amount of dust retained in the lungs.

These methods of expression are discussed by the present author. An example is taken of the relation between dust exposure and the incidence of simple pneumoconiosis in coalminers, and dust exposure is calculated in terms of particle/years per ml. The variation in dust exposure before
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exposure-response curves are given. These are of sigmoid shape. By probit and logarithmic transformation a linear regression of incidence rate of dust exposure may be calculated. Such curves give a measure of the risk of developing pneumoconiosis for

* See above

the extent of 70 per cent.; the use of dust traps of two types, sprays, water infusion and road consolidation for which common salt is used Stone dusting is done only with approved dusts, usually limestone and gypsum.

Research institutes have been rebuilt and re-equipped, and research was beginning on a greater scale than in Great Britain. Of three main research institutes two, at Münster and Bochum, are already complete, and one at Bonn was under reconstruction, the first is financed by the State, the others are research institutes of mine owners and other employers. Besides these three main institutes research was carried on at a number of universities and institutes in Berlin, Frankfurt, Harsewinkel, Bad-Hamm and Gottingen Various methods and lines of research are described, such as electron microscopy, X-ray diffraction, physical properties of

effect of alkali. Calcium was considered to be harmless.

control of dust in coal mines, and the examinations and selective employment of miners

E. L Middleton

SMITH, G C **Occupational Factors in Pulmonary Dust Disease.** *Med J Australia* 1950, Nov 25, v 2, No 22, 777-82 [37 refs]

This is a general treatise on current views and literature on the subject of pneumoconiosis, to which is added a record of some original observations in New South Wales. These will be referred to here

Tests in New South Wales have shown that men engaged in "dragging" bricks from continuous kilns are exposed to very high concentrations of dust containing about 25 per cent of free silica, pneumoconiosis has been found in these workers

A long period of exposure seems necessary to produce disabling pneumoconiosis in coal miners exposed to dust in which the fraction under 10μ contained 1 8 per cent of free silica At breathing level about 5 per cent of coal-dust particles, and only about 1 per cent of sandstone particles, are over 5μ in diameter The average period of exposure of coal miners with disabling pneumoconiosis was

second time being a few weeks after he ceased

concentrations of sandstone dust ranging from 1,150 to 10,000 particles per cc, although water jets were fixed to the pneumatic drills and exhaust ventilation was installed

Dust from basalt rock was apparently the cause of generalized fine mottling in the radiographs from two men after 15 years' crushing, and 35 years' crushing and screening work, respectively; the former was totally disabled, and his radiograph showed large shadows suggesting consolidation

Work in the projection booth of a cinema was the

at the same cinema

dyspnoea and loss of weight, his brother had pain and tightness of the chest. Investigation showed 6,000 particles per cc of air in the booth, the ventilation of which was faulty; analysis of a sample of the dust showed the following percentage

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E. L Middleton

MARCHAND, M. Les pneumoconioses non sclérogènes **[Pneumoconioses without Fibrosis]** *Arhiv Hig. Rada*, Zagreb 1953, v. 4, No. 3, 402-27 [237 refs]

The avowed object of this article is to bring some order into the vast tableau of those pneumoconioses which are not associated with pulmonary fibroses All dusts are more or less injurious, depending upon their nature and amount; no dust is really inert if in excess

that they do not issue a strong warning against the drawing of such conclusions in view of the wide departure of the experimental conditions from those found in human experience] *B. M. Wright*

DAVIES, C. N. **The Breathing of Pneumoconiosis-Producing Dusts.** *Arhiv Hig Rada* Zagreb 1953, v. 4, No 3, 301-6. [11 refs]

To produce pneumoconiosis, a dust must be insoluble or only very slowly soluble Dusts which [illegible]

large numbers of particles in the lymphatic system and throughout the lung

Silica particles larger than 5 microns have little significance, for they cannot reach the alveoli To cause asbestosis, however, fibres must be longer than about 10 microns and shorter than about 1,000 microns Coal dust is less dense than quartz and larger particles can reach the alveoli—the limiting size is about 7 microns or rather more

Attention is also drawn to the hazard from the accumulation in the lungs of radio active dust, and particularly from the solid products of the radio- [illegible]

upper safe limit of radon in industrial atmospheres [illegible]

association between atmospheric radon and carcinoma of the lung cannot be dismissed as impossible
Thomas Bedford

POLICARD, A & COLLET, A Le problème des pous- [illegible] **The Problem of Ultra-small Dusts and its Bearing upon Industrial Pathology** [illegible] 23, No 4, 337–41, 3 figs

The coming of the electron microscope has brought into prominence the existence of dust particles too small to be seen under the ordinary microscope Such particles are less than one-fifth of a micron in diameter. The difference between particles of 0·015 μ (which can be readily detected by the electron microscope) and particles of 10 μ is comparably the same as that between a grain of coal of 1 cc. and a mass of coal of 52 tons Ultra small dusts certainly exist [illegible]

them into the parenchyma of the lungs where they can be seen by modern microscopic technique Normal lungs do not show such particles These facts are illustrated.

The toxicity of the ultra-fine particles is of great importance Apart from chemical composition much depends upon the surface presented to the tissues. The smaller the particle the greater, weight for weight, is the surface But these minute particles tend to agglutinate into minute masses Such little masses would present fewer surfaces than the particles were it not that they have a very loose structure and present considerable internal surfaces which cannot at present be accurately determined Reactions between these dusts and the living cells depend upon the extent of these surfaces, which determine toxicity Such minute particles have been called colloidal. They may be carried quickly by the lymph to the glands They do not undergo sedimentation They should be regarded as molecules of toxic gases to be controlled, as are gases, by ventilation
E L Collis

THOMAS, K & STEGEMANN, H **Darstellung der Fremdstäube aus Lungen und ihre Eigenschaften.** [illegible]

After a review of different methods of isolating mineral dust and coal from the lungs of coal workers, a new technique is described, which consists essentially in heating the dehydrated and largely degreased lung with a large excess of anhydrous formamide at 135°C until all tissue material is gone into solution without production of insoluble humic material. [illegible]

to be below 1 micron

Quantitative results for 40 lung analyses are given. The total dust expressed as percentage of dry lung varied between 3 and 34 per cent For silicosis stage 3 the range was from 4 to 34 per cent.

Iron and total silica were determined in a number of cases and in general it was found that the silica percentage tended to be inversely related to the dust percentage

The amount of coal found varied between 20 and 100 gm in both lungs. This is stated to be more coal dust than had previously been assumed to be present in lungs of workers in the Ruhr.

Attempts to separate the mineral and coal parts of the lung dusts were in general unsuccessful, but small amounts of mineral dust with an ignition loss of 10 per cent. were obtained in one case by vibrating a suspension of the dust in a mixture of methanol and carbon tetrachloride According to X-ray

diffraction analysis this mineral fraction contained 30 per cent. of quartz. It was injected intraperitoneally into mice and produced silicotic nodules

Mineral analyses by X-ray diffraction were attempted and the results suggest that a large part of the total silica occurs in an amorphous form.

Attempts to isolate a coal fraction from human lungs for animal experiments are to be continued.

G. Nagelschmidt

PEDACE, E. A., BACHMANN, A. E & DREYER, M. S. Estudios sobre la neumoconiosis **[Studies in Pneumoconiosis]** *Rev Asoc. Med. Argentina.* 1953, Apr 15–30, v. 67, Nos. 747/748, 89–100, 26 figs [93 refs.]

This article is divided into 3 parts. in the first the authors speak of the clinical aspect of the disease and disturbances of respiration; in the second an account is given of the authors' experimental work. They used various preparations intravenously, pure quartz,

protective action of aluminium in prevention of experimental silicosis" For these last experiments the authors used 4 rabbits, a dog and 14 white rats, and the results may be epitomized by saying that no difference was noticeable between those animals which were treated with aluminium acetate and quartz and those treated with quartz alone, in other words, aluminium was ineffectual in preventing silicosis The article is well documented with nearly 100 references among which British publications are well represented

H. Harold Scott

NAU, C A., NEAL, J. & FREUND, A. P. **An Automatic Dust Feed Apparatus Useful for Exposure of Animals to Dusty Atmospheres.** *Texas Reports on Biol & Med* 1952, v 10, No. 4, 874–82, 7 figs.

When animals are exposed to dust, control of humidity and temperature is required, as well as control of the size of dust particles and their concentration Instead of controlling the air in the dust chamber, the air in the laboratory where the dust chamber was kept was air-conditioned Thus, the compressed air supplying the primary jet for the dust pick-up was cooled by being passed through a copper coil cooled by the air in the laboratory.

A device is carefully described and fully illustrated, which has been in use for a year It creates dust concentrations which can be kept at the same level without significant fluctuations for as long as need be. It is adequate to make sufficient "dusty-air" to supply a chamber 6 by 8 by 10 feet in which various animals can be kept at one time. The dust-laden air is drawn from the exposure chamber to a dust bag placed in a dust house, having two dust-tight compartments The bag is shaken down at frequent intervals into a drawer in the lower compartment Dust sampling is done from various parts of the chamber through port-holes. Various difficulties previously encountered, such as clogging of the venturi tube, have been eliminated. The apparatus, which has incorporated in it a number of automatic controls is claimed to be easy to maintain.

E L. Collis

BAURMASH, L., BRYAN, F. A., DICKINSON, R W. & BURKE, W. C., Jr. **A New Exposure Chamber for Inhalation Studies.** *Amer. Indust. Hyg Ass Quarterly* 1953, Mar., v. 14, No 1, 26–30, figs

In an attempt to produce solid aerosols of uniform concentration and without "dead" spaces, the ... modified inhalation chamber

commercial feeder (Far-Air Model 4 Dust Feeder, Farr Company, Los Angeles) through the bottom of the chamber This travels upwards to a deflector plate whence the dust is driven outwards and downwards An internal metal table for carriage of the ... at variable speeds

WORTH, G & SCHILLER, E. Die Filterfähigkeit der Tiernase im Staubinhalationsversuch **[The Filtering Capacity of the Noses of Animals in Dust Inhalation Experiments]** *Arbeitsphysiologie* 1951, Oct 1, v 14, No 5, 407–12, 1 fig [19 refs]

An introductory section reviews the literature on the filtering capacity of the human nose and its effect on the liability of men to contract silicosis. Experiments are described in which the filtering capacity of the noses of rabbits and dogs was measured

ccurately. The animals were made to breathe a cloud of fine rock-drilling dust with particles below ! microns. Under evipan narcosis a tracheal incision was made and a cannula introduced; thus the dust content of the inhaled air was compared with that of the original air offered. The dust measurements were made simultaneously with two konimeters and two tyndallometers, 8 to 15 readings being taken during 10 to 30 minutes for each experiment. The tyndallometers have since been recalibrated against thermal precipitators, which were not available when the original experiments were made.

The nose filtering capacity of 5 rabbits was found to vary between 77 and 92 per cent, mean 85±5 per cent.; that of 6 short-nosed dogs varied between 29 and 45 per cent, mean 34±9 per cent. It is concluded that dogs are more suitable than rabbits for dust inhalation experiments.

G. Nagelschmidt

BEDFORD, T. & WARNER, C. G. **The Size and Nature of Dust Particles found in Lung Tissue.** *Brit. J. Indust. Med.* 1950, Oct., v. 7, No. 4, 187–94, 2 figs.

This study is based on a detailed examination of the dust particles in two sections of lung tissue from a man who had died of silicosis after working as a shot-firer for many years in an anthracite mine. One of the sections was stained but otherwise untreated; it contained typical silicotic nodules and reticulation areas; this section was used for classifying coal and non-coal particles over 0.4 micron. The other section had been incinerated and treated with hydrochloric acid; all particles in this section were, therefore, non-coal; a nodule and a reticulation area were identified in it.

The percentage size distributions of non-coal particles over 0.4 μ were similar in the treated and untreated sections; the size distributions were similar in the different nodules, and in nodules compared with reticulation areas, but the nodules contained a slightly larger proportion of very small particles, accounted for by the difference in the proportions of coal and other particles. Of all particles measured, 0.3 or 0.4 per cent. were over 5 μ; 17 of these particles were in nodules and 25 in reticulation areas; the largest particles were 8 μ and these were coal; non-coal particles did not exceed 4 μ. The proportion of particles other than coal was 21.1 per cent. in nodules and 14.3 per cent. in reticulation areas.

The size distributions of non-coal particles in the lung section were rather similar to those of non-coal particles in the air-borne dust after ripping shots in stall roads in the colliery where the man had worked and those of coal particles were not unlike the distributions of coal dust particles after shots fired in coal. In the lung sections the proportions of finer particles of both coal and non-coal fractions were lower than in the air-borne dust, and this was in general accord with the known facts concerning the retention of fine dust in the lungs. The question whether particles long resident in nodules had undergone diminution in size by solution was studied, with assumptions as to the reductions in diameter of particles and certain estimations; the computed size distributions were virtually the same as those of the original dust in the reticulation areas; it is suggested that this similarity of size distribution should not be taken to indicate that no solution occurs after particles were deposited in lung tissue. The details of measurement, and classifications and computations are given in tables and graphs.

E. L. Middleton

POLICARD, A. & COLLET, A. Recherches sur la taille des particules déposées dans les diverses régions pulmonaires au cours de la respiration dans un air empoussiéré. **[Investigations into the Size of Dust Particles deposited in Different Parts of the Lungs when breathing Dusty Air]** *Arch. Malad. Professionnelles.* Paris. 1955, v. 16, No. 3, 239–42.

The distribution of inhaled dust particles mostly depends upon observations made upon pneumoconiotic lungs. Chance brought under observation 8 miners who died suddenly while at work; these men were not in any way affected by dust. Only particles of coal were noted, no other particles could be certainly noted were measured; they were grouped ... then on to 4.2 μ, [illegible]

[illegible] those in the alveoli. The [illegible] those in the cervical glands. The [illegible] found in the cervical glands. [illegible] of the particles in the found in the cervical glands. 95 per cent of the particles in the form to indicate that 95 per cent of the particles in the alveoli are less than 2 μ; particles 2 to 4 μ form about 5 per cent. The rest are negligible. These results confirm for healthy lungs the estimates made from pneumoconiotic lungs. Nevertheless, particles as large as 10 μ are found in diseased lungs; how they get there is a mystery.

E. L. Collis

MOTTURA, G. Sul meccanismo d'inquinamento dell' interstizio polmonare da parte delle particelle d polvere isolate **[The Mechanism of the Penetration of Particles of Foreign Matter into the Pulmonary Interstices]** *Med. d. Lavoro.* 195 Jan., v. 42, No. 1, 1–9 [14 refs.] Engl summary

From a study of the literature and from his o observations the author discusses the various po [illegible] of particles of inhaled d [illegible]

[illegible] migrant phagocytes. [illegible] coloured particles, [illegible] observation that coloured particles, appear in the air passages experimentally, appear in the air passages with greater rapidity pulmonary lymphatics with greater rapidity would be possible if they were taken up by mig

cells *The thin layer of liquid* which lines the walls of the alveoli is continually evaporating and being

vessels reach only as far as the interlobular connective tissue at the level of the respiratory bronchioles, the arterioles where they pass into the capillary blood vessels, and the pulmonary venules at their origin, the sub-pleural lymphatic network communicates with that in the interlobular connective tissue; all

derived from the respiratory movements.

E L. Middleton

MOTTURA, G. **Penetration of Dust Particles and Sites of Dust Stores in Pneumoconiosis.** *Brit J. Indust Med* 1952, Jan., v 9, No 1, 65-9, 1 fig [24 refs]

An interesting and somewhat abstruse discussion is presented as to how dust particles get into the connective tissue of the lungs The commonly accepted idea that endo-alveolar phagocytes carry them from the alveoli through the lining walls is rejected Thus, particles reach the pulmonary lymph flow almost instantaneously, certainly in less than 10 minutes, far quicker than phagocytosis on the alveolar surfaces could occur Phagocytic content causes the shape of

alveolar surface, where an interstitial space exists, extending from this surface as far as the origin of the lymph channels Pulmonary connective tissue is much more easily invaded than that of other organs by external substances

further hindering

semination of the same process along collateral pathways is provoked, and, in silicosis, causes silicotic nodules A silicotic nodule acquires its specific properties chiefly because of its situation which usually corresponds to a certain distal tract of the arteriolar and broncho-alveolar branches

E L. Collis

CEMBER, H., HATCH, T. F., WATSON, J. A. & GRUCCI, T. B. **Pulmonary Penetration of Particles administered by Intratracheal Insufflation.** *Arch. Indust. Hyg & Occupational Med.* Chicago, 1954, Aug, v. 10, No 2, 124-9, 6 figs [11 refs]

"*Radioactive barium sulfate particles* were administered intratracheally to rats in order to study the pulmonary penetration and distribution of the particles *Autoradiographs made from lung sections* showed that, although the particles were generally distributed in all the lobes of the lungs, the distribution was not uniform. The radioactive particles were found in irregularly shaped areas throughout all parts of the lungs Retention data showed that about 40% of the material inside the syringe actually was deposited in the deep respiratory tract *The method of intratracheal insufflation directly* through the pharynx may therefore be considered useful for the investigation of particulates in the lungs"

JÖTTEN, K. W. Experimentelle Untersuchungen zur Frage der Lungenschädigungen durch Industriestaube und ihre Verhütung. [***Experimental Investigations on the Occurrence and Prevention of Lung Damage due to Industrial Dusts***] *Schriften a d. Hyg Inst. Landesuniversität in Münster* (Westf.). 1946, No. 1, 66 pp, 32 figs [42 refs]

This is a review of Jötten's own work on *lung diseases* due to dust during the last twenty years

A short introduction deals with methods of measuring dust concentrations, gravimetric sampling, and physical and chemical analysis of dusts The main techniques used are pipette analysis, X-ray diffractio and microscopic petrological examination combine with centrifuging in heavy liquids to isolate th quartz fraction

studied with a variety of

dust, coal, soot, cement, tobacco, basic slag, slate, cotton, chalk and quartz. Animals were also placed in dusty environments in the factories concerned Experiments with wheat, rye and oat dusts are described in some detail The results were negative

Much work was done on basic slag because a high incidence of pulmonary disease, especially pneumonia, occurred in many grinding plants. The damage is said to be complex and largely due to infections

superimposed on tissue irritated chemically by the alkaline character and manganese content of these slags Climatic variations in the working environment are contributory causes

A number of remedies, such as dust control and the use of dust masks, are recommended to prevent

succal produced pneumonia A long list of references to work by Jötten and his collaborators is given.

G. Nagelschmidt

JÖTTEN, K W & VAN MARWYCK, C **The Phagocytosis of Industrial Dusts in Tissue Cultures.** *Brit J. Indust Med.* 1952, July, v 9, No 3, 173-9, 9 figs. [23 refs]

An account is given of a quantitative study of phagocytosis with various kinds of dust introduced into tissue cultures A relationship is reported between the degree of activity of a dust in provoking silicosis and the degree of its phagocytosis For the investigation macrophages were prepared from the spleen of 13-day-old chick embryos, such embryonic tissue is particularly rich in phagocytes. The method of preparation is explained Dust was added to the

cultures after 24 hours' incubation was found best for the visualization of the dust particles by phase-contrast microscopy, since, at this time, no fatty

bronze aluminium. Black aluminium added to quartz *augmented the phagocytosis* of the quartz from 100 per cent. to 159 per cent., sucal dust augmented the phagocytosis to 139 per cent. Black aluminium has been found to retard the development of silicosis in man Limestone dust had no augmenting influence, nor had silver-bronze aluminium. Inert dusts, such as limestone and coal, were rapidly phagocytosed, while the harmful quartz was only *slowly* phagocytosed *The suggestion is advanced* that the greater the power of a protective dust to stimulate the phagocytosis of quartz particles, the greater its protective value against silicosis

E L. Collis

GERSING, R & SCHUMACHER, H Experimentelle Untersuchungen uber die Staubphagozytose. **[Experimental Investigation on Dust Phagocytosis]** *Beiträge z. Silikose-Forschung* 1953, No. 25, 31-61, 9 figs. [34 refs]

The phagocytes of the respiratory surface of the lung constitute the usual defence mechanism against inhaled dust, this mechanism may be disturbed by prolonged or massive dust inhalation, which causes inflammation of the bronchi and inhibition of the

produces silicosis

In an attempt to investigate the relative phagocytic capacity of leucocytes and macrophages, the variations in their structure during phagocytosis of different dusts, *the behaviour of the dust within the cell and* the influence of particle size on phagocytosis, the authors have used a special technique of phase contrast microscopy and cinematography

The *leucocytes* studied were obtained from centrifuged blood and were added to a drop of aqueous suspension of dust on a slide They move at the rate

best criterion of the condition of the leucocytes; very

rounded the phagocyte moves on, leaving a part of the projection round it. The leucocytes cannot effectively take up particles greater than 3 μ; larger particles are broken up and re-transported, small *particles are at first deposited in the ectoplasm*, near the surface, to which they tend to adhere in such quantity that the cell often becomes unrecognizable, there is never a clearly recognizable deposition of dust

undergo fatty degeneration. They have a greater capacity than the leucocytes for intake and storage of dust and can phagocytoze particles of 10 μ, which *are deposited in the endoplasm* After 3 days the phagocytes, especially those which have taken up little

dust, show fatty infiltration, and after 4 days cells in the dust-free section are disintegrated, leaving a detritus, chiefly of fat droplets.

Comparing the behaviour of various dusts—carbon, quartz, aluminium, iron and limestone—the authors found little difference in the manner and extent of their intake by macrophages or in the reaction of the cells themselves, except in the case of quartz This was rather more rapidly and readily phagocytosed than other dusts and the dust-filled cells lost their activity earlier and showed more vacuolation. The quartz particles also remained isolated and equally distributed within the cells, in contrast to the dust conglomerations formed by carbon and other mineral dusts.

Polymorphonuclear leucocytes were found to have only a small capacity for phagocytosis of dusts other than quartz

The article is admirably illustrated by photographs giving a clear demonstration of the progress of phagocytosis and the behaviour of the phagocytic cells

Ethel Browning

HULSE, E. V. **A Concept of Dust Disposal in the Lungs.** *J. Path. & Bact* 1955, Jan.–Apr v. 69, Nos 1/2, 225–30, 11 figs. on 4 pls [16 refs]

In this paper the author formulates a fresh concept of the origin of dust deposits seen in the more distal parts of the lungs, this is based on a study of these deposits, especially the smaller and earlier lesions of individuals who had not been coal miners Human lungs were prepared for histological examination in 3 ways (1) in the way usual at autopsies, (2) by re-expanding the excised lung with 10 per cent. formalin under low pressure, (3) by clamping the trachea before opening the pleural sacs, and fixing the lung in 10 per cent formalin before section. An experimental investigation was also carried out on the lungs of rats that had received intra-tracheal injections of finely divided carbon in water, the third method was used for preparing the lungs for section.

In the human material there were significant [illegible] dust [illegible] ented [illegible] There [illegible] vast [illegible] eolar [illegible] ound over the phagocytes in alveoli adjacent to anthracotic foci. In the experimental animals that survived, a considerable amount of carbon remained in phagocytes in the alveoli and the lymph follicles were almost completely free from carbon, the alveoli were either packed with carbon-filled phagocytes or lined with them; the alveoli containing collections of phagocytes were nearly always adjacent to more solid structures such as bronchi or vessels The appearances suggest that, over the period examined, the phagocytes tend to remain in these positions and show no evidence of migration. In animals allowed to survive for some months an epithelial lining had formed over the phagocytes in a few places; this is shown in one of the 11 photomicrographs, in which a thin epithelial lining extends over a mass of carbon-containing phagocytes

From a comparison of lungs which have undergone collapse with those where collapse has been prevented it is concluded that the normal position of dust-containing phagocytes is within the alveoli and spread out on the alveolar walls, and that they are not dislodged during respiration. When filled with dust these cells are overgrown by a lining of phagocytic cells, which in turn become filled with dust and are themselves overgrown; deposits of dust thus formed appear to be in the interstitial tissue It is suggested that the majority of anthracotic foci are formed in this way, rather than by deposition in the interstitial tissue or in the lymphatic system of the respiratory tract

E L Middleton

GROSS, P. **The Mechanism of Dust Clearance from the Lung. A Theory.** *Amer. J. Clin Path* 1953, Feb , v. 23, No. 2, 116–20

Lung sections from 87 consecutive autopsies in adults were examined In 43 cases moderate to large numbers of alveolar macrophages were present not associated with other inflammatory cells. These 43 cases were studied particularly in relation to anatomical change or structure In 32 cases there were demonstrable changes or relationships, often multiple, that would interfere with alveolar excursionary activity· atelectasis in 22, alveolar oedema in 13, thickened alveolar walls in 13, proximity to bronchi or large vessels in 11, and to scars in 9. In 11 cases there was no demonstrable localization

The daily expectoration of large numbers of alveolar macrophages suggests that a certain amount of proliferation and desquamation is normal Alveolar stasis may be established by increased macrophage production, diminished clearance, or both. In some cases, proliferative activity was indicated by excessive cellularity of the alveolar walls. In most cases, however, there was little evidence of this, suggesting that the presence of macrophages was due to decrease in the rate of removal. This removal is normally effected in the film of fluid which extends from the alveolus to the ciliated epithelium of the bronchiole Seepage of fluid through the walls of the alveolar capillaries is constantly occurring During expiration there is a contraction of the alveolar surface, the fluid layer thickening and being extruded to overlap that moving by ciliary action During inspiration the area increases but the tendency to flow back is to some extent opposed by the viscosity which is greatest at the free surface (owing to evaporation) and least at the base (because of inpouring of fluid) The net result is for the particulate matter to be washed towards the bronchiole to be deposited on the ciliated epithelium.

The author believes that interference in respiratory excursion leading to alveolar stasis is an important factor in favouring dust retention in the alveoli. Pathological change or anatomical localization favouring this was found in 75 per cent of cases having appreciable collections of alveolar macrophages, in the remaining 25 per cent such interference was neither ruled out nor established *A. T. Doig*

GROSS, P. & WESTRICK, Marian **The Permeability of Lung Parenchyma to Particulate Matter.** *Amer J Path* 1954, Mar–Apr, v 30, No 2, 195–213, 1 text fig & 7 figs on 4 pls [36 refs]

The authors attack the concept that macrophages migrating to the free surface of the respiratory membrane engulf dust particles in the alveoli and then return to the parenchyma In order to do so they would have to pass back, swollen with ingested particles, against the force which extruded them into the alveoli The existence of extracellular particles in interstitial positions suggests that they may penetrate into the lung substance without being carried in by macrophages In order to investigate this idea the lungs of rats with trachea attached were removed and suspended in a glass jar, acting as an artificial thorax Air charged with carbon dust was passed by movements of artificial respiration into the lungs through a cannula placed in the trachea The respiration was continued for several hours At the end of 4 hours the lungs were completely black externally and on section Massive invasion of the pulmonary parenchyma by carbon dust was found in the perivascular and peribronchial tissues These particles must have been propelled by the respiratory pressure through the alveolar membrane without the aid of cells India ink was also injected intratracheally into rats in 1 ml doses, the particles were about 0 2 μ The animals were killed 4 hours to 4 days later The pigment was found disposed in a thick layer covering the walls of the air spaces Here extracellular pigment was found within the parenchyma, and was agglomerated to form masses which were frequently too large and too irregular to constitute pigment-laden cells There were also numerous small and larger aggregates which were obviously extracellular

The authors consider at length the possibility of changes taking place in the permeability of the alveolar membrane after death, but see no reason to adopt this idea to explain the phenomena observed They claim to have shown that dust particles can penetrate the respiratory membrane and migrate to perivascular and peribronchial positions without the mediation of phagocytic cells The penetration of [illegible]

may be expected to continue their outward journey entangled in the sputum *E. L. Collis*

POLICARD, A. & COLLET, A. Les mécanismes de l'auto- [illegible]

The lungs have their own means for freeing themselves from inhaled particles of dust The broad lines of these means are understood, but much of the detail remains undetermined Rabbits and guineapigs immediately after exposure to bronze dust had 0 1 mgm of copper per gramme of lung, but after 8 days hardly a trace of copper could be found. Similarly coal-miners after years of work showed the lungs [illegible]

action, the normal rapidity of movement being from 0 25 to 1 cm per minute in the bronchi and 3 cm per minute in the trachea Smaller particles reaching the alveoli are caught in the lymph stream to be passed backwards into the bronchioles or carried by phagocytes on to the pulmonary parenchyma and glands Human lungs act similarly to those of animals

Too little is known as to how these mechanisms are affected by intensity of dust exposure or its length, by the chemical composition of the particles, by the rapidity of breathing, or by other personal characteristics, favourable or unfavourable We do not know at what stage normal dust removal impinges on the abnormal with the appearance of clinical symptoms Until we can recognize the moment when normal dust removal is overpowered, we cannot know exactly when preventive measures are required for minimizing the dust hazard Pneumoconiotic fibrosis is induced when this moment is passed, varying with different dusts, although sufficient exposure to any dust must be regarded as potentially harmful Influences which may retard ciliary action, which may retard or accentuate respiration, or which may accentuate the pulmonary lymph flow, each and all call for further research *E. L. Collis*

PAR [illegible]

A well attended conference was held in Paris in September, 1952, to consider pathological conditions arising from mining Three main subjects were discussed lumbago arising from trauma, the bronchovascular tree and silicosis, and the classification of X-ray shadows in cases of pneumoconiosis

* * *

Turning to the relation of the air-passages to pneumoconiosis, POLICARD set out clearly the minute anatomy of the bronchi, bronchioles and alveoli, pointing out how the dust is removed by the vibrating cilia, and rejected in sputum, but the alveoli have no cilia. Here the phagocytes pick up the dust particles and carry them in the lymph stream to the pulmonary glands Mineral dusts 15 microns in size, whatever their chemical composition, are innocuous, they do not reach the alveoli The submicronic particles are the important ones The larger dusts only irritate and may originate bronchial spasm Prolonged exposure to an excess of dust may finally overcome ciliary action when a chronic inflammatory state of the bronchi results with bronchiolar spasm and alveolar collapse The elastic fibres in the walls of the air-passages atrophy and dyspnoea develops *These are some of the reactions to all mineral dusts*, apart from those induced by such special dusts as silica

The symposium presents a full exposition of the mechanics of breathing and pulmonary ventilation, in investigations of which the spirometer was used to observe reactions to inhaling silica dust Stress is laid on the development of bronchial spasm which modifies and lessens pulmonary ventilation, emphysema results and the dyspnoea of silicosis This notion of bronchial spasm indicates the value of bronchial dilators on the one side and of pressure-therapy on the other This section calls for close study

The last section deals with the need for an international classification of X-ray shadows seen in pneumoconioses Free discussion took place about the classification "Cardiff-Douai" put forward after much consideration by English and French authorities Though *it may not be perfect—and objections were* raised by German representatives—it is the only one in the field It supposes that agreed sample films are used to help observers to classify cases An agreed classification is needed to enable statistical researchers to compare data from different countries and from the same coal-fields at different times

E L Collis

LANDAHL, H. D, TRACEWELL, T. N. & LASSEN, W. H. **On the Retention of Air-borne Particulates in the Human Lung : II.** *Arch Indust Hyg & Occupational Med.* Chicago 1951, Apr., v. 3, No 4, 359–66, 3 figs [Refs. in footnotes]

This paper describes further work by Landahl

measured by either polarization, impaction or microscopy; they varied, in each cloud, by about 15 per cent. from the mass median diameter, although one cloud is stated to have been very much less homogeneous.

Samples of the expired air were taken with impactors at four stages in expiration, in a fashion similar to the experiments of BROWN *et al.* [*ibid*, 1950, v 25, 1254] by means of a rotary switch‡ controlling valves on the samplers, the subject being required to synchronize his breathing with the switch. The samples were washed out with alcohol and estimated colorimetrically.

Studies on the four fractions of the expired air showed that the percentage retention of particles of *all sizes rose in successive* samples, and *that the* rate of rise was more rapid with larger particles than with small.

Studies of the effect of variations in tidal air and respiratory rate were made on two subjects. The results are shown graphically and correspond well with the theoretical predictions of Landahl (*Bull Math Biophys.*, 1950, v. 12, 43). *B M. Wright*

LANDAHL, H. D., TRACEWELL, T. N. & LASSEN, W. H. **Retention of Air-Borne Particulates in the Human Lung: III.** *Arch. Indust. Hyg. & Occupational Med.* Chicago 1952, Dec., v. 6, No 6, 508–11, 2 charts

This paper describes further experiments in which homogeneous aerosols were used to study the effect of rate and depth of respiration on the lung retention of particles of various sizes.

The technique used was that described in the previous paper in this series [this *Bulletin*, 1951, § v. 26, 906] with clouds of triphenyl phosphate of particle diameters ranging from 0 1μ to 6·3μ, with a respiratory flow rate of 60 litres per minute. Retention was found to be higher at this rate than at the lower rates used in the previous experiments. It was also found to increase if the breathing pattern was altered so as to increase the average *time particles* spent in the lung. *B M. Wright*

WILSON H B,

No 4, 346–53

Retention even more than deposition, plays a

lungs was, therefore, investigated by exposing to the inhalation of insoluble oxides of uranium at

* v. II, 375, 378 † v. II, 378 ‡ v II, 379 § See above

known atmospheric concentrations and particle size, for varying periods of exposure One dust sample had a mean size of 0 45 micron and the other of 2 6 microns The duration of the exposure was for one day (6 hours) and for 9 days (54 hours) during an 11-day calendar

lobes after exposure to the small particles The deposition was 150 to 175 per cent greater in the superior right lobe than in any other lobe The amount of retention and the pattern of lobar localization were similar at 54 hours and at 6 hours Essentially no removal appeared to have occurred during the 10 days of exposure, as the uranium content found was precisely what was expected from the daily average deposition Particles of larger size were removed at a faster rate than smaller particles, and

Gross, P & Brown, J H U **The Mobility of Pneumoconiotic Deposits.** *Amer J Clin Path* 1952, Sept, v 22, No 9, 821–32, 8 figs [11 refs]

The generally accepted idea is that dust particles are removed from the alveoli by phagocytosis and carried into the lymph stream, to be deposited in the lung tissues when the phagocytes disintegrate, where they then remain A study was conducted of rats' lungs made pneumoconiotic by the inert dust of antimony trioxide given by inhalation or intratracheal injection, or by dusts of iron oxide and carbon given intratracheally Lungs from 83 adult patients coming to autopsy were also studied Great care had to be taken when examining microscopic sections because of the tendency for the cutting razor to drag the dust particles out of position Excellent illustrations are given to demonstrate the concept that pneumoconiotic deposits are capable of mobilization Normally sharp, smooth contours of pigment deposits are found replaced by "moth-eaten" irregular outlines Extracellular pigment granules were seen, the distribution of which was most dense near the margins of the deposits Fine pigment granules were found as a slurry in alveoli Coarse, angulated pigment occurred within macrophages , and larger pigment masses within the sinuses of lymph nodes Discrete extracellular pigment granules were demonstrated within lymphatic vessels and between fat cells, as well as in other unusual positions As a result of oedema, experimentally produced, peribronchial and perivascular pigment deposits in lungs of rats diminished and ultimately disappeared The prime factor responsible for the mobilization and transport of pneumoconiotic material is oedema fluid The dust granules may be transported within the lungs without the help of phagocytic cells

This study does not suggest that all pneumoconiotic deposits are capable of mobilization or that phagocytic transport does not take place.

carbon *E L Collis*

[16 refs]

The simplest pathological reactions to industrial pollutions are those due to vapours or gases which irritate in proportion to their specific weight and solubility , heavy, soluble gases tend to be fixed by the

Metallic dusts of manganese, beryllium, vanadium and osmium may start chemical reactions in the lungs which may sensitize them to virus infections.

Dusts which seem to be otherwise harmless may cause trouble by blocking up the air passages and

This paper, which runs to over 120 pages, deals with the relation between dust *composition and concentration* and observations on pneumoconiotic lung tissue sections with the polarizing light microscope. It is arranged in 4 parts The first part reviews the crystal structures of the chief minerals which occur in mine dusts and brings text-book illustrations of silicate and other structures The second part first describes the main rock types which occur in a number of mining districts, including coal, iron ore, slate, graphite and talc mining Thin sections of rocks are shown and sieve analyses of drilling dusts obtained under standard conditions are given and discussed

From extrapolation of the sieve analyses the properties of the respirable dust are estimated A risk value based on Landwehr's previously published system is introduced

Later, in the second part of the paper, the change

of 2 μ may still occur

A few figures are given next for dust concentrations found several years ago and now for different coal mining operations

Part 3 is a selective review of the literature dealing with a number of mineralogical observations on the decomposition of felspar, syntheses of clay minerals, and papers dealing with observations on silica solubility and certain animal experiments in silicosis research

Part 4 gives observations based on 500 sections from 62 lungs ranging from normal persons through coal workers, iron stone workers, graphite and talc workers to sand blasters

should have appeared extensive stains of double refracting *interstitial tissue were seen. A series of* illustrations shows a sequence from dust deposits without such tissue to pictures showing massive strands of it The advantages of using polarized light microscopy on unstained tissue sections embedded in Canada balsam, and of the same technique on stained sections, are stressed, and several colour photographs are reproduced.

The authors conclude that quartz dissolves and produces fibrous tissue, probably through the intermediate action of colloidal polymerized silicic acid If other silicates are dissolved they produce silicic acid which is not polymerized but rapidly excreted from the organism

The examination of the lung sections usually showed much less quartz and often more mica or talc than is found in the composition of the airborne dusts This finding may be related to the platy habit of mica and talc

Silica solubility alone is not considered to give a full explanation of the origin of silicosis. It is considered that platy and fibrous minerals may be more difficult to remove by phagocytosis from lung tissue than isometric minerals, and their accumulation in the lung may inhibit the lymphatic drainage and thus increase the fibrogenic action of dissolved silica

G. Nagelschmidt

MOTLEY, H. L **Clinical Pulmonary Physiology. I. Evaluation of Function Impairment and New Developments in Therapy of Chronic Pulmonary Disease.** *Arch. Indust. Hyg & Occupational Med.* Chicago 1952, June, v. 5, No 6, 554-65, 1 diagram [Refs in footnotes]

MOTLEY, H. L. **Clinical Pulmonary Physiology. II. Detection of Early Lung Function Changes in Industrial Exposure.** *Indust Med & Surgery.* Chicago 1953, June, v. 22, No 6, 262-7, 6 figs

The use is described of a newly designed respirometer for measuring the maximal breathing capacity, by providing a minimal breathing resistance, on a mechanical recorder. It records the rate and depth *of breathing*, and also the *total volume of air for* the maximal breathing capacity. The subject takes a deep breath and then blows the air out of the lungs as rapidly and as completely as possible; then the procedure is reversed *by first blowing out the air as* much as possible, followed by the deepest possible breath The largest volume of air which could be blown out during the first three seconds in the standing position, after the deepest possible inspiration, was called "the three-second vital capacity". The three-second vital capacity volume is the physiologically effective portion of the vital capacity and the only portion which can be used with a respiratory rate of 15 or more per minute

The normal range of Maximal Breathing Capacity *in men is from 120 to 200 litres per minute*, in a significant degree of emphysema it is 40 litres per minute. The presence of bronchospasm was evaluated by measuring *the MBC before and after* one intermittent *positive pressure breathing treatment* with the simultaneous administration of a potent bronchodilator drug such as vaponefrin or isuprel The increase in *MBC following the dilator was interpreted* as representing *the amount of bronchospasm* present

The efficiency of the lungs as bellows is measured by the three-second vital capacity, the MBC, and the residual air capacity as percentage of *total lung* volume. An excellent correlation has been shown to exist between the ventilation factor and *these 3* measurements For the more serious degrees of impairment of pulmonary function the *MBC is* decreased more than the ventilation factor or the three-second vital capacity

Five cases of young men are presented *to show* that detection of normal MBC was a useful screening test

Spirogram readings obtained with the respirometer provide a tremendous amount of information on the state of the lungs, they can be obtained easily and quickly. The large 13½-litre respirometer used for spirogram tracings, some of which are reproduced, provides the least mechanical resistance to the deep rapid breathing necessary to obtain satisfactory values By this method early lung function abnormalities may be detected before subjective or X-ray changes are apparent Should the observed measurements of the three-second vital capacity or the MBC be reduced more than 15 per cent from the predicted measurements, the individual should be carefully considered before being allowed exposure to environmental breathing hazards

E. L Collis

BUHLMANN, A Oxymetrie, Arbeitsversuche und [illegible]

The author discusses various methods for determining the oxygen saturation of the blood and states that, with the co-operation of Dr SIGRIST, a new oxymeter has been developed By applying [illegible]

[illegible] is described Three of these were on healthy person[illegible]

[illegible] emphysema showed under-saturation with a load of 150 watts, but accommodation with a load of 60 watts. In all these cases the reduction of working capacity, whether produced artificially in healthy persons or by disease, was a consequence of interference with lung function , the heart and circulation had only a secondary importance Another patient, with cardiac insufficiency owing to mitral disease, showed a moderate fall of saturation with small loads and no significant under-saturation in the arterial blood

By a gradual increase of the load the limit of possible adaptation of a patient with impaired pulmonary function is defined. When the important factors are imitated in healthy persons they likewise lead to a diminished capacity for effort The difficulty of differentiating between pulmonary and cardiac insufficiency is discussed

E L. Middleton

CLAEYS, C Place de l'oxymétrie dans l'examen fonctionnel du pneumoconiotique **[The Place of Oxygen Measurements in Examination of the Functioning Capacity in Pneumoconiosis]** *Rev. Méd Minière* Douai. 1954, v. 7, No 25, 19-26, 2 text figs. & 4 figs on 2 pls [25 refs.]

Diminished oxygenation of arterial blood—hypoxia—should be a useful measure of lung-function in cases of pneumoconiosis The presence of oxygen is estimated by the difference in the amount of red [illegible]

[illegible] current emitted by the two cells is measured on a [illegible]

[illegible] was associated with cardiovascular lesions resulting from the pneumoconiosis, many subjects showed diminished oxygenation with or without [illegible]

E. L. Collis

HASSELT INSTITUT D'HYGIENE DES MINES Communication No 125 Action des poussières et [illegible]

After giving a short summary of previous investigations into vital capacity and pulmonary ventilation, the authors describe a study made on 30 normal persons, 17 men and 13 women, aged between 20 and 26 Observations were made on vital capacity and maximum expiration per second, 150 tests on each person gathered at 15 seances Vital capacity was noted to increase as the seances progressed, particularly between the earlier ones. The average increase [illegible]

[illegible] mena should be taken into account when testing the effect of drugs or dust exposure upon lung function.

E. L. Collis

CRAW, J. **A Note on Somatotyping in relation to certain Chest Conditions.** *Trans. Ass Indust. Med. Officers.* 1953, Apr., v. 3, No. 1, 215–18. Discussion 218–19.

The relation of bodily physique (somatotyping) to disease is as old as Hippocrates, who spoke of the phthisic and apoplectic habitus Three types are put forward—the asthenic or ectomorphic, the middle or mesomorphic, and the pyknic or endomorphic. The asthenic represents 10 per cent. of the people, the middle 77 per cent, and the pyknic 13 per cent. A large community of colliers who had been somatotyped were then X-rayed, 26 per cent. of the asthenics showed signs of tuberculosis, 11·7 per cent. of the middle types, and only 4 5 per cent. of the pyknics In another study of 441 Lancashire miners, all of whom had applied for compensation under the Silicosis Acts, the asthenics with positive radiological findings showed a tuberculosis incidence of 57 5 per cent, compared with 19 8 per cent in middle types, and 16 9 per cent. in the pyknic types When haematite miners were typed a similar result was obtained

At first sight such results seem convincing, but in the discussion the point was heavily stressed that the asthenic condition was the result of the tuberculous infection, rather than the precursor, and that nothing in these results determines whether a particular body type predisposes to tuberculosis or to progressive massive fibrosis, they are compatible with the view that the changes in the index of body type were themselves caused by disease [The abstracter knows of no serious study of what physical type succumbs to tuberculosis, and can recall fine athletes and well-built persons who became asthenics only after infection] *E L Collis*

OLLINO, P. & BREUSA, M Le pneumoconiosi iniziali studiate radiologicamente con la manovra di Valsalva [**Valsalva's Manoeuvre in the Radiological Study of Early Pneumoconiosis**] *Rass Med. Indust* Turin. 1954, Mar–Apr, v. 23, No. 2, 104–8, 6 figs. on 7 pls [14 refs]

Valsalva's manoeuvre or experiment was devised for the inflation of the Eustachian tube by taking a deep inspiration, then closing the mouth and nose and exerting a forcible expiratory movement The [illegible] the same method of Valsalva [illegible] " of [illegible] ture [illegible] imo- coniosis changes The distension of the closed lung system with air under some degree of pressure produces a depletion of the pulmonary venous system and removes some of the opacity which is due to the circulating blood The authors illustrate their case by several pairs of X-ray photographs taken with Valsalva's manoeuvre and also in the more ordinary way for comparison *J. Cauchi*

HAUBRICH, R. & SCHULTE, R. Über die L[illegible]

[illegible]

The English summary appended to the paper is follows.—

"For the early forms of a few rare pneumoconiot cases certain roentgenological minute structures a shown The corundum lung can be called an examp for a striated bronchitical lung structure which r *sembles the roentgenological findings of the aluminiu* lung and is compared roentgenologically and pathol anatomically with the picture of the chronic per bronchitis and the diffuse development of bronchie tasis The early stages of the soot lung with di seminated reticular pattern are compared with simila pictures of the honeycomb lung and Boeck's sarcoi Their resemblance is traced back to a topographica *histological conformity* The superminute *granulari* of the ochre dust- and iron ore lung is mentioned a third structure form of initial stages of pneumoconi osis It can be put into roentgenological and topo graphical-anatomical relations with similar structure in miliary Boeck's pulmonary sarcoid and some form of haemosiderosis of the lung."

SALVINI, M. Il mediastino nella pneumoconiosi studiato con il retropneumomediastino [**Medi astinum in Pneumoconiosis studied by Means o Retropneumomediastinum**] *Med d Lavoro* 1953, Oct, v. 44, No 10, 429–48, 8 figs [13 refs]

The English summary appended to the paper is as follows —

"As a contribution to the research on the origin of fatigue in workers already exposed to inhalation of dust, the author was asked to investigate on a number of subjects by means of pneumomediastinum effected through presacral way Of these, 15 had not been continually exposed to dusty environments, 35 had been exposed to the inhalation of dust for professional reasons The pneumomediastinum thus effected was very well tolerated by all the patients, and it was *ascertained that* 39 *patients out* of 53 presented an anomalous radiological pattern at the mediastinum [illegible] of the abnor- [illegible]

"*It is believed that* there *must* be some relation between the anomalous radiographic pattern at the *pneumomediastinum* and the cardiorespiratory func- [illegible] to be

severe radiographic manifestations due to the parenchyma, and inversely, it is possible to have normal mediastinal patterns in subjects with radiological manifestations of ascertained silicosis

PROC. ROY SOC. MED. 1952, Sept., v. 45, No. 9, [31 refs] ...upational ... R. S. F., CRUICK-

The first section of this discussion stresses that occupational medicine is a speciality which has long been disregarded. Much of health and disease depends upon the environment of daily work with its hazards

down rocks in coal mines in South Wales, but "rippers" in Durham, and "brushers" in Kent do the same work. Most industrial hazards arise from inhaling harmful dusts and fumes, the physical and chemical nature of which must be understood. Many instances of dermatitis arise from either direct contact with or allergic reaction to the manipulation of industrial materials. Every practitioner should study the industries in his area, but an industrial

work In time emphysema develops. The allergen causing the bronchospasm has not been isolated, but histamine has been suspected. These men experience high mortality from respiratory diseases. The study of byssinosis throws light on other instances of allergic asthma.

Occupational pulmonary diseases due to dust provide another example of trouble exclusively caused by industrial environment Many pulmonary lesions are so originated, which may simulate the well-known silicosis, either because the dusts clog up the lungs, *e g*, tobacco dust, or set up a fibrotic reaction in the lungs, *e g.*, coal dust, or because the dusts are opaque to X-rays, *e g*, iron or barium dust. A number of non-occupational troubles may also simulate

Occupational exposure alone can in many cases determine the importance of clinical findings

E. L. Collis

PROC ROY. SOC MED 1952, Sept, v. 45, No 9, 576–86 (Sect Exper. Med & Therap. 22–32), 4 figs [30 refs] **Discussion on the Diagnosis of Pulmonary Emphysema** [GOUGH, J.; FLETCHER, C M.; GILSON, J. C. & OLDHAM, P D.]

Three methods of diagnosing emphysema are discussed First comes the pathological in which

is the type most commonly seen among coal workers, and has been ascribed to foci of coal dust shrinking together under the force of inspiration on the lung around these solid foci Unexpectedly, lungs of chronic spasmodic asthma showed little evidence of chronic irreversible emphysema Asthma does not seem to produce central lobular emphysema Honey-

lung there are no hubs and spokes, only the rim

Clinical diagnosis is presented in an experimental study in which 8 skilled clinicians expressed their opinion regarding the presence of certain physical indications, usually stated in text-books to be signs of emphysema, in a series of 20 patients, half of whom had massive fibrosis The opinions of the observers differed greatly, pointing to great inter-individual disagreements; even on chest expansion surprising disagreement occurred The opinions expressed are shown in a series of information histograms Frequently agreement as to the presence of any physical sign was little more than might be obtained by tossing pennies! No absolute measurement of emphysema was found Possibly some of the traditional text-book signs of emphysema should be rejected, lessening the burden placed upon students of employing methods based upon tradition rather than upon experiment. This study indicates that a clinical diagnosis of emphysema, except in most advanced cases, cannot be made with any confidence

The third study is of objective physiological

measurements of function to indicate the existence of emphysema. The one examined is the residual capacity (R C), *i e.*, the amount of air remaining in the lung at the end of expiration As this must

as synonymous with some degree of emphysema. But this percentage naturally increases with age, which must be allowed for The conclusion is that no single test will ever be specific, as the types of emphysema may be many, each with its own functional disturbance. Instead of one test, several are suggested, combined in the form of a discriminant function, each test being weighted, if necessary, for age.
E. L Collis

SCHEPERS, G. W. H. **Industrial Asthma and Bronchitis.** *Indust Med & Surgery* Chicago 1955, Feb., v. 24, No 2, 53-61. [Numerous refs]

breathe is more important than the water we drink and the food we eat. The more the air is contaminated the more do we experience asthma, bronchitis, bronchopneumonia, pneumonia and emphysema Industrial exposure accounts for more contaminations than can be enumerated in a single article, however condensed. These diseases seldom occur singly, nearly always in combinations Even simple byssinosis, sen-

origin which ...

asthma is too great to state, they may be vegetable like cotton, or animal like furs Many mineral substances and inorganic compounds act by direct chemical irritation rather than by sensitization

workers and not at all among those living at high altitudes. Now radio-active substances are coming into the picture and call for research, just as have the compounds of beryllium. All mining dusts, whether of coal or the dangerous quartz, must b under suspicion, and still the air passages are ope to attack from fumes of carcinogenic materials, onl too readily inhaled. The influence of industry i determining bronchitis may be judged by quotin comparative mortality data (standard taken as 1000 for certain dusty occupations in Great Britain i 1931:—cement workers, 542; sawyers, 792, grai millers, 847, metal moulders, 724; coal boat loaders 1,982, brick and tile workers, 1,994; cotton strippers 5,579
E. L Collis

UEHLINGER, E *Mischstaubpneumokoniose und Atelektase* **[Mixed-Dust Pneumoconiosis and Atelectasis]** *Arch f Gewerbepath u Gewerbehyg* 1955, v 13, No 5, 495-507, 7 figs

In contrast with the focal and compensatory emphysema which accompanies mixed-dust pneumoconiosis atelectases have received little attention *Atelectases of segments and lobes of the lungs are* ... they can occur as the ... bronchitis, super- ... bronchial or lung ... portance of large ... ion of the capillary surface in contact with the alveolar walls, and, by augmenting the compensatory emphysema, the respiratory dead-space is increased, respiration becomes difficult, even in rest, partial or complete invalidity results, and the progress of the pneumoconiosis is hastened

Two cases are recorded in detail. The first is that of a foundry worker who had been employed in cleaning castings and sandblasting, and was exposed to dust containing iron, coal and quartz for 40 years The clinical and radiological history is described in full and the clinical diagnosis was given as mixed-dust pneumoconiosis, grade II, with chronic bronchitis and slightly decompensated cardiac hypertonus The radiographs had shown a dense, wedge-shaped shadow in the position of the right middle lobe and scattered, small opacities over the lung fields; tubercle bacilli were not found in the sputum. He died with severe dyspnoea and heart failure Autopsy showed mixed-dust pneumoconiosis, grade I–II, with ... nodules in all lobes complete atelectasis of the ... of the ... thraco- ... iastinal ... is given ... ust was composed of carbon and iron; examination ... double-refraction showed scattered quartz particles It is emphasized that in this case the obstruction of the bronchus was brought about without a tuberculous process

... diagnosis was mixed

in a foundry as smelter, castings cleaner and sand-blaster, and was exposed to mixed dusts of iron, coal and quartz for 13 years In 1935, when aged 42, he had repeated attacks of bronchial catarrh; he was off work for 3 months in 1941 with cough, night sweats and loss of weight; the radiograph showed increased lung markings with stippling, tubercle bacilli were not found in the sputum; in 1945 an attack of pneumonia in the right upper lobe occurred, and the radiograph showed dense shadowing in the right upper and middle zones, the breathing was difficult and vital capacity was reduced. The clinical diagnosis then was pneumoconiosis, grade II, with non-tuberculous pneumonia in the right upper lobe undergoing carnification In 1949 the radiograph showed, for the first time, a clear space in the shadow at the right upper lobe During the next 2–3 years periods of lost work occurred owing to attacks of febrile bronchitis and bronchopneumonia with loss of weight and strength In May 1952 haemorrhage occurred and the patient complained of lumbago; a radiograph showed changes at the 2nd lumbar vertebra, probably the result of metastasis of carcinoma On admission to hospital on 5th August there was severe cachexia, radiographs showed a large smooth-walled cavity in the dense shadow at the right upper lobe, and destruction at the 2nd lumbar vertebra; on 18th September total paraplegia occurred and the patient died on 12th October A very full description is given of the findings at autopsy It showed adenocarcinoma in the right upper lobe at the hilum with compression of the bronchus; total atelectasis of the right upper lobe with a central abscess cavity, metastases in the liver and right kidney, osteoclastic metastasis at the second lumbar vertebra with compression of the lumbar cord and the cauda equina. The history showed that the carcinoma began in 1945 and ran a course of 7 years Until 5 months before death it had remained hidden by the dense shadow of the atelectasis, and the lumbar metastasis led to the explanation of the aetiology and pathogenesis of the bronchial occlusion Although the carcinoma in this case was in close apposition to the pneumoconiotic fibrous tissue the author considered that it did not show a causal relationship, because the carcinoma did not arise from the fibrotic tissue but was itself surrounded by it

E L Middleton

Bastenier, H Critères d'aptitude au travail chez les sujets atteints de pneumoconiose **[Criteria of Capacity for Work for Persons affected with Pneumoconiosis]** *Arch Belges Méd Sociale, Hyg, Méd du Travail et Méd. Légale.* 1954, July, v 12, No. 7, 265–81. [50 refs.]

Belgian law enacts that persons employed in certain listed occupations with exposure to dust must ubmit to medical examination before engagement nd thereafter every two years Industrial doctors re appointed to undertake these examinations. So ar 10,254 workers have come under observation, in ddition to 115,035 miners whose examinations were performed under the terms of a separate ordinance. Both employers and employed must follow advice given by the doctor as to capacity for work on engagement and on return to work after any sickness-absenteeism.

The doctor must decide whether any pneumoconiosis is present, and whether it is complicated or simple. Complications may be due to tuberculous infection or to cardiac disturbance. Tuberculous infection is the more serious; it varies greatly according to the dust hazard, that from silica dust being the most important. Next comes asbestosis. The X-ray pictures of silicosis and asbestosis differ enough for one to be distinguished from the other. The shadows in asbestosis are more diffuse and free from nodules Tuberculosis may be indicated by fatigue, loss of appetite and weight and X-ray findings apart from finding *Myco. tuberculosis*, a further valuable sign is the rapidity of the blood sedimentation. Open cases of infection may be a danger to others and require segregation Hypertrophy of the right ventricle with cardiac incompetence must be looked for; it may indicate the need for rest.

When the pneumoconiosis is simple regard must be had to the extent to which working incapacity is present, and this may be more difficult to decide than the clinical picture. Many workers with definite X-ray indications may be suffering no incapacity and may be allowed to continue at work under more frequent medical supervision than the two years demanded by law Measurements of vital capacity by spirometer, and the use of the bicycle-ergometer, or other exercise test, may help in determining capacity or dyspnoea Evaluation of capacity fo work will frequently be the most difficult part of th industrial doctor's work. Estimations may depend upon physiological tests of function When the clinical picture and the physiological capacity have been dealt with, there still remain psychological and economic factors to consider In fact the burden imposed by law upon the doctor is heavy

E. L. Collis

Motley, H L. & Tomashefski, J. S. **Treatment of Chronic Pulmonary Disease with Intermittent Positive Pressure Breathing. I. Evaluation by Objective Physiological Measurements.** *Indust. Hyg & Occupational Med.* Chicago. *Arch.* 1952, Jan., v 5, No 1, 1–9, 6 figs. [Refs. in footnotes]

Motley and his colleagues have previously reported on the treatment of pneumoconiosis and other chronic pulmonary conditions with intermittent positive pressure breathing of oxygen containing broncho-dilator aerosols [this *Bulletin*, 1951, v. 26,* 159, 912. *West Virginia Med J*. 1949, v. 45, 125]. Further experience indicates that it provides a very promising method of relieving dyspnoea in the majority of cases of emphysema and pulmonary fibrosis. Most of the patients were able to increase their activities, some even to return to work. The authors have used two types of apparatus made

*pp. 213, 49

respectively by Mines Safety Appliance Co., Pittsburg, and V. Ray Bennett, 320, South Robertson Boulevard, Los Angeles, California. Treatments varied in individual cases, the usual procedure being three daily for 20 minutes, a course lasting 2 or 3 weeks. Maximum pressure was 20 cm. of water during inspiration, falling ... during expiration

... volume was not significantly increased after a course of 2 or 3 weeks, but in one case in which treatment ... daily for 9 months residual air volume ... per cent of total ... per cent t l.v.). ... drainage is also ... volume is not ... hors assert that pulmonary emphysema is not made worse and that in 4 years during which the treatment has been in daily use, no cardiac ill-effects have occurred, nor, when oxygen is used, have alterations in the electrocardiogram been observed [The total number of cases treated is not given and there is no statistical analysis of results . table I relates to measurements of vital capacity and maximal breathing capacity after one treatment in 300 consecutive cases of silicosis, and table II to similar measurements in 41 cases of silicosis after a course of treatments.]

A. T. Doig

KENNEDY, M. C. S. **Cortisone in Pneumoconiosis with and without Reversible Bronchoconstriction.** *Lancet.* 1954, Jan 9, 77–9. [17 refs]

In order to investigate the effect of cortisone on pneumoconiosis, 12 males with chronic lung disease were given by mouth 100 mgm cortone acetate daily for 14 days Estimations were made before, during and after administration, of the expiratory flow rate, and of the erythrocyte sedimentation rate The degree of reversible bronchial constriction was assessed by measuring the expiratory flow rate before and after inhalation of 1/1000 adrenaline Details of the observations made are presented in 2 tables The mild euphoria usually experienced with cortisone made the men say that their breathing was easier, but no increase occurred in the expiratory flow rate No evidence was found that cortisone enhanced the adrenaline effect. Nor did the 10 men who had pneumoconiosis exhibit any radiological change after treatment with cortisone. Similarly, the erythrocyte sedimentation rate showed very little change either during treatment or afterwards

This investigation did not suggest that cortisone heightens the broncho-dilatory action of aerosol adrenaline. The finding that cortisone had little or no effect upon the group of patients under observation is not at variance with the improvement reported in berylliosis and in pulmonary sarcoidosis, since the pathology of these conditions is quite different from that of pneumoconiosis Patients with pulmonary tuberculosis were carefully excluded from the group chosen; but the studies made gave no evidence that any hidden focus was activated by the cortisone. A conclusion is that cortisone has no place in the routine treatment of reversible bronchial constriction associated with pneumoconiosis as seen in coalworkers or in pottery workers *E. L. Collis*

SANDER, O A. **Rehabilitation of Persons with Pulmonary Dust Disease.** *Arch. Indust Hyg & Occupational Med* Chicago. 1951, Dec, v 4, No 6, 541–8, 7 figs

The author writes with experience of men ... He considers that efforts

... cancer, then he becomes a psychopathic compen-tion drawer Instances are given of men found 15 years ago by X-ray to exhibit shadows indicative of pneumoconiosis, whose lungs in 1950 showed no advance, although they had been at work ever since; X-rays taken with 16 years between are illustrated, to demonstrate the stationary condition of the lungs Cases are also quoted of aggravated and intractable "doctor-induced" disability The successful control of silicosis includes keeping the men at their regular work, and assuring them their lung changes will not progress to a dangerous stage with improved dust control. Here, optimism, rather than pessimism, is the most important phase of rehabilitation *E. L Collis*

MCLAUGHLIN, A. I G. **The Prevention of the Dust Diseases.** *Lancet.* 1953, July 11 & 18, 49–53, 104–9, 18 figs [34 refs]

This paper is based on the Malcolm Morris memorial lecture delivered under the auspices of the Chadwick Trust The description of the methods employed in preventing the ill-effects of inhaling industrial dusts is preceded by a brief historical review. Then follows a classification of the dust diseases of the lungs in which the author points out that the subject is a wide one, by no means confined, as is often thought, to a small group of pulmonary fibroses due to inorganic dusts such as silica, asbestos or coal. Several excellent photomicrographs illustrate his description of the

[illegible]

tional fibrosis of the lung and the annual figures are steadily increasing About two-thirds of the number of deaths occurred in coal miners in whom the rise has been especially steep. The author considers that part of the increase is probably due to more accurate diagnosis or at least to a greater interest in the problem.

The principles of prevention are dealt with under three headings; the replacement of the harmful sub- [illegible]

a critical spirit, showing that some methods of dust removal, accepted as good practice for many years, are much less efficient than they are popularly believed to be For example, dust which is invisible in good daylight, and therefore thought to be non-existent, is clearly demonstrated rising from a grinding wheel fitted with the standard type of hood and exhaust ventilation, when the immediate vicinity is illuminated with a strong beam of light—the Tyndall beam The use of antidotal dusts is also discussed.

The article forms an excellent and valuable account [illegible]

for closer co-operation, leading even to integration, between the hospitals and industrial medical officers

A. T. Doig

STAUB Düsseldorf. 1954, Mar 15, No 35, 5-10

[illegible] Workplace]

The General Conference of International Labour Offices and their administrative council have been occupied since 1952 with the question of protecting the health of the worker in the workplace. On June 22, 1953, the Conference adopted the recommendation stated in detail in this article It includes many decisions which refer to dust, smoke and fume and the injury to health which may be caused by them.

[illegible]

ture, dampness and objectionable odours; provision [illegible]

tion, and custody of dangerous substances. Means must be taken to substitute safe for harmful materials, to prevent the formation of dangerous substances and to protect from dangerous radiations, to separate or enclose dangerous processes to prevent exposure to dust, gases and fumes in dangerous concentrations; provision is required of localized mechanical ventilation for removal of dangerous dust, gases, etc., protective clothing and personal protective equipment, with instruction in their use, and provision for the cleansing and maintenance of these. The worker must be instructed in the importance of the protective measures provided and in his duty to use them properly and to take care of the equipment; consultations with the workers should be considered an important means to that end The air of workrooms in which dangerous substances are used must be examined at frequent intervals by specially competent persons to control the concentrations of dust, fumes, etc.; notices must be posted directing attention to special dangers and the precautions to be taken, representatives of the employers and the factory inspectorate shall confer on the means for carrying out these orders

II Medical examinations must be provided for workers employed on processes dangerous to health, shortly before or shortly after commencing the work, or at specified intervals The authority of the country shall arrange for consultations between employers' and workers' organizations on the occupations for which the examinations are to be carried out and the manner and frequency of the examinations, depending on the degree of risk in the occupations; their purpose shall be to detect the first evidence of disease and to decide whether an occupation is inherently dangerous to health. If such a decision is reached a certificate to that effect shall be given; this certificate shall be preserved by the employer and produced to an inspector when required and shall remain at the disposal of the worker The examination shall be made by a doctor specially experienced in occupational medicine, the result shall [illegible]

the practice and development of methods of treatment of affected persons. The authority shall order the compulsory notification of cases of occupational disease, or suspected cases, and shall indicate the time limits for notification, and the particulars which it must contain. The authority shall make a list of occupational diseases, or symptom groups, which shall be revised from time to time.

IV. Means shall be provided at the workplace for

giving first aid for accidents, poisoning or other forms of illness; the authority of the country shall prescribe details of these by regulation.

V. General direction to each country, state, province or canton to carry out this recommendation.

E. L. Middleton

MEIKLEJOHN, A. **The Development of Compensation for Occupational Diseases of the Lungs in Great Britain.** *Brit. J. Indust Med.* 1954, July, v. 11, No. 3, 198–212 [30 refs.]

The story of the development of compensation for pneumoconiosis in Great Britain is here well and painstakingly told. It commenced early in this century, and is not yet fully worked out. South Africa had set an example; but there the problem was comparatively simple; only one industry—gold

so far as possible, to be kept out of any industry with a risk from silica. Hence, pre-employment examinations had to be instituted to exclude the tuberculous, and periodical examinations were needed to remove any infected person. Such infected persons, although possibly not silicotic, had to be compensated The early stages of silicosis did not incapacitate the worker, and the stage at which he should be compensated had to be determined in his own interest to withdraw him from further exposure to the dust. Many were the medico-legal points to be settled which called for expert knowledge, and experts had to be appointed to decide them.

At the same time industry after industry was claiming to be included in compensation schemes—Sheffield grinders of knives on sandstone wheels, placers of "green" pottery in flint-filled saggers, sandstone masons, tin miners, rock-men in coal mines, sandblasters in foundries, and others Scheme after scheme was made under regulations, each containing some improvement on its predecessor and suited to the needs of the particular industry. Meanwhile a new but very similar disease, asbestosis, due to asbestos dust, had to be added to silicosis The diagnosis of both was greatly assisted by the X-ray appearances of the lungs which showed characteristic shadows cast by the fibrotic nodules in the lungs.

Next came coal-miners, apart from rock-men, work- ... the anthracite mines of South Wales. Many ... of the ... was more ... Here there was no special tendency to succumb to tuberculosis and the X-ray shadows showed a different pulmonary pathology. This disease was called "the pneumoconiosis of coal-miners" and was granted compensation under the Coal Mining Industry (Pneumoconiosis) Compensation Scheme Another disease had now called for attention, namely the chronic asthmatic condition occurring from exposure over years to dust from bales of cotton when opened ...

clearly.

So far, as each industry was scheduled it was called upon to insure against its liability. But the National Insurance (Industrial Injuries) Act, 1946, removed from employers the liability of bearing compensation payments and placed the responsibility on the State by a fund maintained by compulsory contributions from all insured persons and their employers. The time is ripe for some general term, such as the "pulmonary disability" of the Union of South Africa, to replace the named diseases which when caused by occupation will justify compensation. How far this scheme will serve the cause of prevention has yet to be seen In the past, any efforts at prevention met the reward of lessened compensation payments. Thus, the old-time great sandstone grinding wheels of ...

thrown off by carding engines in cotton mills was brought under control by well-engineered exhaust draught, and so forth. In South Africa prevention has always been part of the work of the compensation Board by rigorous control of dust underground In Great Britain, apart from lessened compensation payments, prevention has been pressed forward by the Government Inspectors of Factories and Mines, by whose advice preventive measures have been made obligatory.

E. L. Collis

MINISTRY OF NATIONAL INSURANCE. **National Insurance (Industrial Injuries) Act, 1946. Pneumoconiosis. Report of the Industrial Injuries Advisory Council in accordance with Section 61 of the National Insurance (Industrial Injuries) Act, 1946, on the method of prescribing Pneumoconiosis under the Act** [GARRETT, A W., Chairman] Cmd 8866 23 pp. 1953 London: H.M Stationery Office. [9d]

Pneumoconiosis for the purposes of the National Health (Industrial Injuries) Act, 1946, means "fibrosis of the lungs due to silica dust, asbestos dust, or other dust, and includes the condition of the lungs known as dust-reticulation" It is at present prescribed in relation to a single schedule of occupations grouped under 12 headings The question of the method of its prescription, that is, the definition of the classes of insured persons eligible for benefit for the disease, was referred to the Industrial Injuries Advisory Council in 1950, and appears to have been very thoroughly examined by the Industrial Diseases Sub-Committee, who had the services of Dr E L MIDDLETON as specialist adviser Written and oral evidence was received by specific invitation from certain persons and general invitation by advertisement in the press.

The Council advises that there should be no change [illegible] should not obtain in the case of claimants from unscheduled occupations if the foregoing recommendation is adopted Amendments or additions to the schedule of occupations should be framed in broad terms rather than in detailed reference to individual processes Investigations should be made into unscheduled occupations shown to be giving rise to cases of pneumoconiosis. Certain modifications of the disablement pension are suggested.

This is an interesting and readable report, the value of which is enhanced by the clear picture it gives of the present position and procedure *A. T Doig*

VERH. DEUT. GES F. ARBEITSSCHUTZ. Darmstadt. 1953, v. 1, pp. viii + 146, 36 figs. [Numerous refs.] Arbeitstagung in Frankfurt/M. am 30 und 31. Oktober 1952. Thema Die Fünfte Verordnung über Ausdehnung der Unfallversicherung auf Berufskrankheiten. **[Fifth Schedule of Extension of Compensation for Industrial Accidents and Diseases]**

The fifth (1952) Schedule of compensatable industrial accidents and diseases is based largely on the third (1936) and fourth (1943) but represents an extension of the existing lists and an alteration in the conditions of compensation already allowable in some disorders, particularly silicosis and asbestosis

New additions to the list include disorders due to cadmium, beryllium, chrome and their compounds; chronic disorders of tendons and muscles; nerve pressure paralysis, chronic bursitis, fracture of spinal processes, meniscus injuries in miners, fluorosis of bones, joints and ligaments, and corneal injury from benzoquinone

Compensation in silicosis and asbestosis is no longer limited to "severe" grades, lung disorder from basic slag is now recognized in a variety of industries, including agriculture, aluminium injury is no longer limited to aluminium dust, noise deafness is recognized in the textile as well as other industries, and cataract in foundries and metal smelting Industrial compensatable diseases are defined as "those caused during industrial activity in one of the occupations listed in Section III of the Schedule" and both the injurious effect and the bodily or mental incapacity must be in direct causative association with the recognized activity

It is suggested by DEMIANI that the legal decision on cause and association cannot be strictly scientific but that in practice the relation need not be completely free from doubt.

In "New Points of View in Silicosis Research", BECKMANN discusses the differences in radiological appearances of the lung in severe silicosis before and since the war

At present the lesions are much finer and more diffuse with a relative absence of coarse granulation He attributes this chiefly to modern improvements in technique, especially water spraying, which has re [illegible] fine dust is prevented

[illegible] tuberculosis

* * *

Beryllium poisoning has been recognized as a compensatable disease in Germany since 1942. The new Schedule includes not only respiratory injury but also secondary complications of heart and circulation, kidneys, liver, skin and bones NIEMOLLER describes the symptomatology and radiological changes in the lungs, and suggests treatment with electro-aerosols and aurin-tricarboxylic acid, though its efficacy has not yet been confirmed

* * *

The fact that only since 1939 has any significant injury from inhalation of *aluminium dust* been recorded, and that it has in fact been recommended as a protection against silicosis, is explained by LEDERER by recent changes in industrial aluminium processes, whereby the particles are much smaller than formerly and the protective layer which was formed by the earlier addition of stearin is no longer found.

On the whole the symptoms, and the pathological and roentgenological appearances in "aluminium lung" (a term preferable to "aluminium dust lung", because the effect of inhaled aluminium is now believed to be chemical, not mechanical), are much slighter and less specific than those of silicosis. The characteristic variation in the lungs is a thickening of the respiratory parenchyma by collagenous tissue, with a tendency to hyaline degeneration—a process which has been called "stroma sclerosis".

Other characteristic features are the development of these symptoms and physical signs in younger workers and their rapid progress within 6 months to 2 years.

The new Schedule recognizes "Disorders of the lower respiratory tract and lungs due to aluminium

or its *compounds*", and their severity need not be estimated.

Ethel Browning

STÖKLY, A Neue entschadigungspflichtige Berufskrankheiten. **[New Schedules of Compensatable Industrial Diseases]** *Ztschr f. Unfallmed. u Berufskrankh.* 1953, *June* 15, *v.* 46, *No.* 2, 106–10.

A new Order in Switzerland (1952) extends the classification of substances whose production or use carries a health hazard. The former classification contained about 85 individual substances and 17 chemically related groups, the new list includes 82 individual substances and 41 chemically related groups

The chief advantage of the classification by chemical grouping is that injury caused by any new compound belonging to any chemical group in the list can be scheduled as an industrial disease and any insured person compensated quickly without waiting for further revision of the Order

Some of the more important substances included are briefly described

Among the irritants of skin and mucous membranes are acrolein, aluminium chloride, thionyl chloride, tetryl, zinc oxide, petrol, cement and calcium hydroxide, the last two are of special importance in the causation of industrial eczema Other substances in the new list include methyl alcohol, 4–6 dinitro orthocresol, beryllium, cadmium, chloralkylamines, ... halogenated derivatives ... f plati- ... charge, ... rland), ... lusts",

The author hopes that in time the list will be extended to include not only chemical substances but also mechanical injury and industrial bacterial infection *Ethel Browning*

VIGLIANI, E. C. La nuova tabella delle malattie professionali assicurate Proposta di alcune modifiche in base alla esperienza della Clinica del Lavoro di Milano **[The Proposed New Insurance Schedule of Occupational Diseases. Suggested Modifications made in the Light of Experience at the Milan Clinica del Lavoro]** *Med d Lavoro.* 1952, Oct, v. 43, No 10, 343–55.

The Italian Law of 1934 carried only 6 occupational disease conditions for which it required compensation The outbreak of war in 1940 interfered with the amendment of this law which was then pending Special emergency legislation to provide compensation for silicosis and asbestosis was enacted in 1943 when thousands of claims were being brought before the Courts of Civil Law

A new Schedule has now been prepared by the Labour Inspectorate and approved by the Cabinet for submission to Parliament In this, 40 disease conditions or sets of conditions are classified and described on an aetiological basis The Schedule ...

Vigliani submits and recommends an amended Schedule which includes 6 additional headings which ...

... due to talc, and (6) pneumoconiosis from barium ...

U.S DEPT. OF HEALTH, EDUCATION, AND WELFARE. **Occupational Health and Safety Legislation.** A Compilation of State Laws and Regulations [TRASKO, Victoria M.]. *Pub. Health Service Publication No. 357.* pp. xxiii+315 1954 Wash. 25: U S Govt. Printing Office [$1 25]

"This compilation of citations and excerpts or digests of laws and regulations dealing with occupational health and safety has been prepared in response to the growing interest in such legislation. By briefing and making accessible under one cover widely scattered information, this publication enables a convenient checking and comparison of various State provisions"

DRINKER, P. **Engineering and Industrial Hygiene.** *Brit Med. J* 1954, June 12, 1337–40

... ndus ... iene ... able ... It ... tate ... sure ... ance ... mes companies have developed first-class inspection ... with doctors, engineers, hygienists and chemists, and have freedom of entry to factories and *inspection*, ... factory inspectors have The interest ... time to a ... erica take ... *dly lacking* in Great Britain]

Industrial hygiene laboratories of the Public Health Service are available to industry. [Britain has nothing of this sort] New York is the only State with a medical inspector of factories. The Bureau of

Mines has an excellent experimental station at Pittsburgh which issues specifications for protective equipment of all sorts. *America* was also ahead with the *Journal of Industrial Hygiene*. Again, the American Standards Association *formulates* "allowable concentrations" for atmospheric impurities; "threshold limit values" are also published. A list of gases, vapours, toxic dusts, fumes and mists, with their threshold limit values, is given; the figures are the lowest limits rather than precise values. *Prevention* is the key-note of industrial hygiene. Some standards of noise levels are calling *for* attention; the trend is towards a *level* which permits ordinary conversation. When *compensation* is awarded for impairment to hearing arising out of occupation, action will be *accelerated*.

E. L. Collis

The superimposition of tuberculosis on simple silicosis causes *the X-ray to show a fluffy outline* of varying intensity; moreover, progressive massive fibrosis may result, seen as rounded masses in the sub-apical regions and in the mid-zones close to the hilar areas. Observations on erythrocyte sedimentation

mines are comparatively new. *E. L. Collis*

VERSTER, A. W. S. **Some Aspects of the Silicosis Problem in South Africa.** *South African Med. J.* 1954, Oct 2, v. 28, No. 40, 841–3.

Study of silicosis occurring in the gold mines of South Africa has led the world in its knowledge of this most important of the pneumoconioses. Recognition of the prevalence of the disease among the gold miners on the Rand caused the Silicosis Bureau to be set up in 1916. Since then the activities of the Bureau, described in its annual reports, have been a splendid example of control established over a causative hazard—the inhalation of fine silica dust—brought about by scientifically applied dust prevention. As the dust hazard has been lessened, the length of time of working underground before silicosis becomes manifest has steadily increased, from 109 months in 1918 to 272 months in 1949. At the same time the disease is being recognized much earlier with less and less superadded tuberculous infection. Cases of massive tuberculo-silicosis, in which the lungs at autopsy bulge out of the chest which is too small to hold them, have become the exception. The risk varies with different processes and the Bureau grants permission to perform this or that class of work. X-ray appearances of the chest are the determining criteria.

For Africans who stay in the mines for only short periods, up to 2 years, the hazard is not so much silicosis as infection with tuberculosis, which is combated by careful selection before engagement and good feeding and hygiene while in the mines. In South Africa a great deal of legislation has been devoted to silicosis; and all of it is enforced by the Bureau.
E. L. Collis

Sou

This Report extends over the period from August 1944 to March 1948 but omits a period of eight months August 1945 to March 1946, to enable an annual report to be produced in future with each year ending 31st March. Apart from this change the Report follows the lines of its predecessors. During the period covered the Silicosis Act 1946 was introduced and it provided that miners with less than 6 years' service in dusty occupations are examined once a year instead of every 6 months. [Previously the Medical Bureau had functioned under the Miners' Phthisis Acts, Consolidation Act of 1925.] Clinical and radiographic records of over 205,000 miners and 70,000 African labourers are now in the possession of the Bureau. *The average total number of examinations made in* each of the three years was about 65,000, and the average daily number was about 200 examinations

passed fit, 30 per cent. are deferred for a further examination, and 30 per cent. are rejected. Dr. Verster contributes an article on the initial examination of recruits; in this he gives special consideration to

before applying to the Bureau.

The incidence of compensatable diseases among miners is given in detail in schedules. For the purposes of the Bureau silicosis means any form of pneumoconiosis due to the inhalation of mineral dust. The prevalence of silicosis, that is the total number of cases found in any one year, was for the

occupations whether or not they had been ... benefits, instead of being debarred from such work directly they were awarded a benefit.

The numbers of new cases of silicosis detected during the three years were, respectively, 232, 278 and 207; the respective production rates were 8·89, 9·19 and 7·29 per 1,000. The production rates of silicosis showed a high positive correlation between the proportion of service in dusty occupations spent at machine work and the incidence of silicosis; in the three years under review the groups: "no machine work"; "up to 50 per cent."; and "over 50 per cent." machine work were, respectively, 5·7, 10·7 and 24·8 per 1,000 employed. The corresponding rates for the period 1929–32 were 23·3, 37·3 and 68·2 per 1,000.

Bureau, but mainly to the immense technical advances achieved in suppressing and removing dust. The effect of these improvements is shown in a comparison of the dust determinations at various pro-

the chief factor in the rate of progression. The Bureau is compiling statistics with a view to determining whether silicotic miners who continue to work in dusty occupations progress more rapidly to the advanced stages than those who withdraw from such work.

Pathological investigation of 969 lungs from Europeans showed that 520 were free from silicosis and tuberculosis, 336 had silicosis without tuberculosis, 88 had silicosis with tuberculosis, and 25 had tuber-

non-silicotic miners, tuberculosis was present in two

silicosis are given. The conclusion to be drawn from this correlation series is that generalized mottling of the radiograph, especially of the upper zones, is the only reliable single sign of silicosis.

E. L. Middleton

South Africa, Union of. **Report of the Silicosis Medical Bureau for the Year ended 31st March, 1949** [Verster, A. S. W., Chairman] 12 pp. 1950. Pretoria. Govt. Printer [2s. 6d.]

——. **Report of the Silicosis Medical Bureau for the Year ended 31st March, 1950** [Verster, A. S. W., Chairman]. pp. 13+7, 4 figs. 1950. Pretoria. Govt. Printer [3s]

7 75 in 1949–50 In the previous triennial period the rate was 9 44 Much of the information given regarding the incidence of compensation cases of silicosis

A S W. Verster are important. He finds that the type of silicosis likely to develop depends on the amount of silica dust inhaled; that a correlation

South Africa, Union of **Silicosis Medical Bureau. Report for the Year ended 31st March, 1951** [Verster, A S W., Chairman]. 42 pp 1953 Pretoria Govt. Printer [11s. 6d]

The function of the Silicosis Medical Bureau is essentially to decide questions of compensation on account of silicosis contracted in the gold mines The reader finds himself faced with an extensive mass of

of the Bureau

The number of radiographs of the chest taken during the year was 67,177 Dusty occupations involving machine work and the incidence of silicosis,

The first paper by R. B. EVANS on Sampling and Determination of Airborne Particulate Matter gives a general description of atmospheric impurities as dusts, mists, fumes and smokes, their origins, physical characters, dimensions and methods of collecting and examining them. The Impinger is the most widely used dust sampling instrument in the United States; it can be used for sampling gas and mist, as well as dusts, when proper liquid absorption media are used. To reduce fatigue and increase speed and accuracy in counting particles a micro-projector has been introduced which increases the magnification up to 5,000 diameters.

In a Demonstration of the Principles of Industrial Exhaust Ventilation, K. E. ROBINSON, Ventilation Engineer, dealt with the design of apparatus and plant for controlling dust in manufacturing processes, and the principles and practice regarding ventilation, and referred to a manual then in preparation by the Ventilation Committee of the American Conference of Governmental Industrial Hygienists about which the author was prepared to submit particulars.

electric activity or inactivity as a basis, and representative reactions of some of these dusts which were very insoluble were demonstrated These

fibrotic reaction in 30 days. In a note written later the author states that when carefully sized to 3 μ,

found encased in a lesion resembling a granuloma, these lesions were not found in the control animals out of the field The hypothesis was *offered "in an unproven state for the explanation of fibrogenesis within tissues".*

Some Unusual Phenomena Accompanying the Crushing of Silica was the next paper, presented by W. A. WEYL, he was describing work sponsored by the Office of Naval Research on the catalytic properties of silica and siliceous materials (WEYL, W. A., *Research*, (1950), 3). The paper deals with surface

quartz crystal or a piece of *vitreous* silica, or by dehydration of silica gel. Demonstrations were given of colour reactions produced by the oxidizing action of silica, and an explanation was based on atomic structure.

Future Trends in the Pneumoconioses were discussed by A. J. LANZA. He referred to the changing

growing conviction of the limited value of the X-ray film, and a great need for physiological tests for the amount of impairment of pulmonary function.

operate.

A paper on a Proposed System of Records covering Incidence and Progression of Silicosis in Ontario Gold Mines was given by N. F. PARKINSON, Executive Director of the Ontario Mining Association He gave particulars of the numbers employed in the gold mines, from 1,000 wage earners in 1913 to 14,574 in 1947. The assessment of disablement was made by a Silicosis Referee Board comprising three officials of

of successful claimants for compensation was 18 years. In 1948 a committee was set up by the Minister of Mines, with wide terms of reference, to review the arrangements for recording the medical data; the Committee found the existing arrangements for recording and follow-up inadequate and cumbersome, and made recommendations which are recorded in this paper.

G W H SCHEPERS of the Silicosis Medical Bureau of South Africa, in a paper on Pneumokoniosis in South Africa discussed the aetiology, pathogenesis and clinical manifestations of silicosis, and problems connected with diagnosis, prophylaxis and certification, and an appraisal of the progress achieved in South Africa This paper forms an excellent review

greatest emphasis on dust control as the first and most important factor in the prevention of silicosis, and claimed for the treatment with aluminium powder only that it could play a part in the prevention of silicosis by taking care of that amount of siliceous material that cannot be removed from the atmosphere The result of a study, which covered eight years of exposure, showed that of 15 treated men all remained with normal chests; of 13 controls, 10 showed early nodulation, 2 were undetermined, and one chest was

normal The best response to aluminium therapy was in the type of case with thickening of the alveolar walls due to the presence of damaged phagocytes; the least suitable cases were those in whom silicosis had developed over a long period, and those with severe complicating emphysema or secondary infection. It was not the chief aim of the Foundation to promote the use of aluminium therapy, but a much broader programme for the eradication of silicosis in which dust control was the prime factor.

F. ROHDE, Medical Director, Mexican Mining Association, described aluminium therapy in Mexico. He summarized the practical results [illegible] harm- [illegible] the [illegible] ection [illegible] nent, programmes for dust and medical control have been encouraged, morale of workmen has been improved and better relations between management and workmen have been noted, investigation so far, [illegible]

[illegible]

emphysema on a quantitative basis (as determined by expressing residual air as a percentage of total lung volume), the lung ventilation efficiency (as determined by the percentage oxygen uptake from the inspired air), the distribution factor (unequal alveolar aeration and perfusion), and the pulmonary circulation The final evaluation of the pulmonary function impairment is based on all the factors, information provided by the many physiological tests discussed, and no one single test is satisfactory

E L Middleton

REV. MÉD MINIÈRE. Douai. 1953, v. 6, No. 21, 1–23. Réunion Médicale au sujet de l'expertise en matière de silicose. **[Technical Conference on Silicosis]** Institut de Médecine Légale et Sociale —Lille (25 Janvier 1953).

This issue contains an account of a conference on silicosis The papers read include one by M. MARCHAND on medical examination, one by M. MULLER on legislation, one by L CHRISTIAENS on the radiological classification recently accepted by international agreement, one by E SAVINEL on examination of respiratory function, and one on a numerical method of assessment of disability in relation to compensation for silicosis. The last takes into account the radiological features, and the results of spirographic tests at rest and during exercise The papers should be read in full.

Charles Wilcocks

HASSELT INSTITUT D'HYGIENE DES MINES. Gén / 200 Communication No 104 Service médical [illegible]

Mar 10, 11 mimeographed pp

Some 30 doctors interested in industrial pneumoconioses attended the congress reported upon in this short memorandum. The number of different industries from which instances were described is notable, more so than any new facts regarding clinical symptoms or pathological findings These industries included gold-mining in South Africa, coal-mining in South Wales and on the Ruhr, iron-ore mines in Siegerland and Dill-Scheldegebiet, the getting of graphite containing small amounts of silica, slate quarr[illegible] aceous [illegible] stones [illegible] ling, [illegible] of cement

There was agreement that the greater the exposure to dust of free silica, the more serious the amount of pneumoconiosis But the association of other dusts, which might be inert alone, with silica dust, by [illegible] dusts was held to cause mixed pneumoconiosis Coal dust may be instanced here, since pure coal dust is mostly harmless, but in excess will clog the lungs Some dusts composed of calcium seem to confer a certain amount of protection A feature of pneumoconiosis is the appearance of tuberculosis as a secondary superimposed infection, but this seems to bear a direct relation to the extent of the lung trouble due to the presence of silica

E. L. Collis

GÄRTNER, H. Gedanken zum Silikoseproblem. **[Meditations on the Problem of Silicosis]** Reprinted from *Deut. Gesundheitswesen.* 1949, v. 4, No. 28, 5 pp.

may be possible. Much progress has been made, especially in Switzerland, in diagnosis and assessment of disability, and much more emphasis is now placed than formerly on the results of functional tests as against the radiological findings.

In order to prevent progression of the disease, workers should, according to the Swiss results, be

to show the effectiveness of this method. Intensive dust control is of course also necessary. In Europe this technique is not always possible for various social and financial reasons.

One of the most important lines of present and future research is the study of protective dusts, to be carried out jointly by physical and chemical methods, animal experiments and by field work and post mortem studies.

The recognition of the constitutional factors and of individual susceptibility is a further medical research problem.

Gärtner disagrees with other authors who had stated that the technical problems in silicosis prevention were solved. Dust control in drilling should be improved, dust removal by ultrasonics and electrostatic precipitation studied, and the techniques for studying the dusts below 2 microns, and especially for measuring dust concentrations, should be improved. Further work on the solubility of silica is also desirable.

Finally the objections to early invaliding are discussed They are chiefly loss of status and reduction

required.

G. Nagelschmidt

VIERTELJAHRSSCHRIFT DER NATURFORSCHENDEN GESELLSCHAFT IN ZÜRICH 1950, Dec 31, v 95, Beihefte Nr 2/3, 194 pp, numerous figs. Ueber die Silikose II. Teil **[Silicosis. Part II]**

This survey follows the lines of that of 1947 [see *this *Bulletin*, 1949, v. 24, 134] An introductory review of the work of the Zurich Society for Investigating and Combating Silicosis in Switzerland is followed by eight articles on statistical data and medical and scientific research

I. *Summarized survey on the Swiss Accident Insurance Fund (SUVA) since 1947*, by F. ZOLLINGER and F. LANG.

Of the total number of cases of silicosis reported between 1932 and 1937 the following figures show

compensated cases of silicosis was 1,715; 401 disabled, and 440 deaths; the total cost was 18 03 million francs. Arranged in the 5-year periods from 1932 to 1947 the total numbers of silicosis cases were, respectively, 136, 354, and 1,225. Preventive measures introduced included examinations for fitness for work with a risk of quartz dust inhalation; in the 4½ years to July 1949, of 11,529 examined 1,268 *were rejected; 585 on account of silicosis, 348 for* tuberculosis, and 146 for other pulmonary affections

Notes are given on some investigations which have been undertaken The first of these was on pneumoconiosis in foundry workers; in the 113 cases the average duration of employment was 28 2 years; radiographic signs appeared after about 18 years and reached stage III in 33 years; the type of lesion was mixed dust silicosis; signs of active tuberculosis were present in 26 cases; 48 workers were incapacitated; 16 died, most of them in advanced ages, in 7 cases tuberculosis was present In one large metal works 131 cases of silicosis were reported, and of these, 54 certified, and 19 not certified, were sandblasters; in this factory the sandblasters are now the best protected workers.

large films should be used.

An investigation into the effects of grinding with artificial abrasives gave results similar to those found in other countries; prolonged exposure led to subjective symptoms of bronchitis of asthmatic type, and some X-ray changes of bronchitis and peri-bronchitis; neither silicosis nor tuberculosis resulted from the inhalation of these dusts *Rapidly* developing silicosis was investigated among rock workers. In one fortification 24 cases of silicosis

of the dust, and insufficient means for its suppression, similar work in rock with a lower quartz content was not followed by rapidly developing silicosis. Vigorous preventive measures, medical as well as technical, have been introduced. An investigation among granite workers showed a low incidence of

* v II, 86.

silicosis, characterized by a slow and relatively benign course.

The use of streptomycin in the treatment of silicosis accompanied by tuberculosis has not been very encouraging; further work was being done on this subject.

Finally in this article a review is given of Swiss legislation for the compensation and the prevention of silicosis

II *The Bronchogram in Silicosis*, by H. R. SCHINZ and U. COCCHI.

The aetiology and pathogenesis of changes in the

per cent showed bronchial changes of varying severity, bronchiectasis diagnosed by clinical and radiological examination accounted for only about 27 per cent. of those in whom it was present.

III. *On Blood Albumin Examinations in 88 Cases of Silicosis*, by C. PAGNAMENTA.

A normal blood albumin picture was found in about half the cases in the early stages of simple silicosis, and in only one-third or less of the more advanced cases In simple silicosis the type of protein reaction was the so-called indurative-fibrotic type. In silicosis with bronchitis the reaction was similar to that with simple silicosis but with a tendency in the direction of the inflammatory-exudative type When inactive or latent tuberculosis was associated with the silicosis the dysproteinaemia was as marked as in the severe stages of simple silicosis, often with the inflammatory-exudative reaction in the foreground; the plasma reactions were rarely normal and were not infrequently accompanied by an erythrocyte sedimentation rate (ESR) up to 30/40 mm, a "veiled" Weltmann reaction [i.e., a normal reaction accompanied by a high ESR], and a positive cadmium reaction. Clinically active tuberculosis accompanying a strongly marked type of reaction with extreme left in the Weltmann reaction and the increase of the ESR, positive and increase of α-globulin and The investigations showed that the picture should not be used by junction with the results of the and bacteriological examinations it assumed a high practical importance.

IV. *Studies of the Patho-Physiology of Respiration in Silicosis; Lung Function in Exercise Experiments*, by P. H. ROSSIER and A. BÜHLMANN.

This article includes a review of the extensive literature on the subject and an account of some original experimental research. The method and apparatus used in the experiments are described, they included a bicycle ergometer with a dial recording the effort directly in Watts; and a closed spirometer system At the end of the work period of about 8 to 10 minutes arterial blood was taken from the brachial or radial artery, and measurements were made of oxygen capacity and saturation, the oxygen tension in the plasma, and the pH and the CO_2 content of the plasma

The results are given in detail, from a subject with normal lungs and from ten patients with various stages of silicosis from 0–I to III. The experiments showed that in healthy persons there were no substantial variations in the arterial blood, the increase of the ventilation, the oxygen absorption and the functional dead space, as well as the pulse rate, corresponded with the amount of the load. Good

generally applicable Experience showed that radiographic appearances gave no indication of the severity of the functional damage, and this was again confirmed by these investigations

V. *The Silico-Anthracosis of Foundry Workers*, by J R RÜTTNER.

The main topic dealt with the pathological findings in eleven cases of silico-anthracosis in foundry workers. These rranged in groups 4 cases sis; 5 anthracosis with 1 2 silg. of silico-anth pulmonary The and the

of mixed-dust silicosis which was its most widespread form. It was to be noted especially that dust which contained a relatively small proportion of silicosis-producing material may, through prolonged exposure, lead to severe lung changes and even to death.

VI. *The Presence of Rutile in Lung Residues*, by A. GLAUSER and J. R. RÜTTNER.

The mineral rutile—TiO_2—has been found in all the mineral residues of silicotic lungs examined. Seven instances are mentioned which include lungs from workers in rock, slate, coal, and foundries, and in a healthy lung In the slate-worker's lung rutile formed about one per cent of the total residual dust, the needles were usually ½–1 μ broad, and 4–8 μ in length; but needles up to 3 μ broad and 15 μ long were found. It was concluded that rutile may be found in healthy as well as in silicotic lungs, because of its widespread mineral distribution; it was easily caught in the lung tissue, and it was chemically resistant

VII. *Comparison of the Minerals found in the Dust in Silicotic Lungs with that of the Rocks Worked*, by A GLAUSER.

Six fatal cases of silicosis were selected for study, in which the history of employment indicated the conditions of exposure to dust at the work places; these were in various rock formations in different parts of Switzerland The dust was isolated from a large portion of lung which was dried, ashed at 500°C and treated with hydrochloric acid, the dust was examined microscopically by an immersion method; the mineralogical examination was also made by the immersion method on the powdered material, chemical analyses were made of the rock material and the lung ash The methods of preparation and examination are described, and the results are given in detail for each case included in the study.

In four of the cases the presence of calcite was shown in the dust to which the workers had been exposed, but it was not found in the lung, either in the sections or in the collected ash, in any quantity worth mentioning Glauconite, which must have reached the lungs in one case, was not found in the lung ash Biotite occurred in the rock in one instance, but was found only sparsely in the lung dust Feldspars present in the rock dusts were also found in the incinerated lung sections and in the acid-insoluble ... of the lung ash chemical analyses of acid-

...

exogenous mineral in the lung with about one ... quartz and two-thirds feldspar Sericite present in important quantity in the rock dust, in two cases, was also present in the lung ash in large amount, analysis of the acid-insoluble portion gave a high alumina value In incinerated sections many particles of 1·4 μ were observed, having sharp corners and edges and showing no evidence of a process of dissolution; particles under 1·5 μ were rather rounded in form and without edges Among accessory minerals rutile was pointed out, especially in one case where slate had been worked Zoisite and epidote were frequently observed in the lung dust from a case exposed to granite.

VIII. *The Critical Examination of Dust-Producing Plant*, by H GESSNER and H. BÜHLER.

This is a long detailed technical article on the production of dusts which cause silicosis, the analysis, particle-size determination, and measurement of the amounts of the dusts arising under different working conditions, and the influence of sedimentation and ventilation on the concentrations of the dust clouds

The various types of dust-producing equipment and the conditions under which they were used have

...

particle size of considerably less than 10 μ would be a more suitable criterion from the hygienic point of view, since most of the particles retained by the ... the dust cloud were around 1 μ in size

...

mgm /m³ must be regarded as uncertain, ... less than 5 mgm./m³, even after long exposure, atmospheres could be regarded as no longer dangerous

[This article contains the results of much careful observation and should be read by those interested in the control of dust under similar conditions]

E L. Middleton

UNIVERSITY OF LONDON · BRITISH POSTGRADUATE MEDICAL FEDERATION. **Lectures on the Scientific Basis of Medicine.** Volume II. 1952–53 **Silicosis** [KING, E J.] [Lecture VII, pp 108 38, 22 figs (21 on 13 pls)] pp xi+380, numerous figs 1954. London · Athlone Press, Senate House, W C 1 [35s]

In this lecture Professor King gives an account of the history of silicosis, of the theories which have been advanced to explain it, and of modern views on pathogenicity. The solubility of silica is acknowledged to be a main factor, and solubility is related inversely to the size of quartz particles. The silicates ... than quartz and ... dusts produce ... of experimental animals. Mixtures of some ... containing kaolin) and quartz depress the solubility of the silica, probably as a result of the small amount of aluminium

or aluminium hydroxide contained in the stone dust becoming dissolved to a sufficient extent to be deposited on the quartz particles

The author traces the history of prevention of silicosis, and discusses the crystal structure of mineral dusts, and the size of dusts, in relation to pathogenicity He comments on the "weathered" dust theory and discusses the acute toxicity of silica and the possible mechanism of silicosis.

This lecture is based on a large amount of work, [illegible] this *Bulletin* It is an [illegible] opinions, by an [illegible] *itions to the* [illegible] lems. [illegible] *les Wilcocks*

ROCHE, L, MINETTE, A & BARON, J. Travaux récents sur la silicose pulmonaire [*Recent Studies on Pulmonary Silicosis*] *Arch Malad Professionnelles. Paris* 1955, v 16, No. 4, 348–52 [72 refs]

Summaries of recent articles on pulmonary silicosis are here gathered under various headings The first deals with the clinical aspects from the early appearances of X-ray shadows with slight shortness of breath to advanced dyspnoea with massive shadows thrown by coalescing nodulation, often associated with superimposed tuberculosis Here attention is paid to 388 autopsies carried out on South Wales coalminers All forms of advanced pulmonary fibrosis with or without tuberculosis are not necessarily sili[illegible] lung cancer and silicosis is [illegible] particularly in the South Wales [illegible]

Much research has also gone forward on the pathogenesis of silicosis with regard to the type of silica dust to blame, the importance is stressed of size of particles, those below 5 microns in diameter being incriminated, the smaller the more harmful down to ultramicroscopic dimensions. Freshly fractured dust is now considered, size for size, to be more harmful than "old" dust Other dusts when mixed with silica vary in their actions; some, like alumina, are held to inhibit the capacity of silica to induce fibrosis others, like iron, seem to be quite inert. *Every mixture of dusts calls for special investigation* [illegible] particles reaching the alveoli of the lung [illegible] according to their chemical and phys[illegible] re[illegible] At each stage the authority for the conclusions is quoted. *E L. Collis*

WORTH, G, SCHILLER, E & DICKMANS, H. Vorschla[g] zur Durchführung einer einheitlichen Silikose Statistik mit dem Hollerith-Verfahren [**A Proposal for Uniform Silicosis Statistics kept by the Hollerith System**] *Beiträge z Silikose Forschung* 1951, No 14, 35–53, 1 fig [13 refs]

Causation and detailed symptoms of silicosi[s] involve so many factors that modern statistica[l] methods in which machines are used are the onl[y] possible way of extracting the full information fro[m] the statistical data Previous published papers ar[e] almost useless for this purpose as the differen[t] enquiries are usually not comparable *The Holleritl method* is recommended and a detailed scheme o[f] recording medical data is presented with full pro posals for coding medical histories, *symptoms, result of examination, etc It is recommended that th[is]* scheme should be used generally in Germany, [if] necessary after full discussion and possibly modifica tions Number of years above or underground, roc[k] or coal work, mine, quarry are the only environ mental records, but it is recommended that simila[r] statistics "possibly even in collaboration with th[e] doctors" should be undertaken by the non-medica[l] workers in silicosis research *G Nagelschmidt*

the silicotic changes began, and then proceeded through all the stages from early reticulation to nodulation and advanced massive fibrosis Either … present alone and run its course alone

[illegible]

The author, using a series of clever symbols to indicate processes followed, keeps a picture of the occupational history of every one of his patients from the day he was first exposed to a dust hazard. … condensed case histories are repro-

[illegible]

develops and chronic invalidity is established X-rays are of value in determining the presence of fibrosis, but quite often (11 per cent in this series) they show no shadows during life, though advanced fibrosis may be found at post-mortem

The only way to fight the scourge lies in prevention Pecuniary doles to the afflicted or his family will not prevent it The dust hazard must be tackled with vigour Limitation of hours of work is no good Drills constructed with axial water feed to keep down the dust will not be used overhead when the water drenches the miner It is an engineering problem which must be solved [No explanation is advanced of why silicotics succumb so often from tuberculosis, without which pulmonary silicosis would be a far less serious infliction]

E L Collis

PERI … dangers at silicose

[illegible]

Miners in the Swiss Canton of Valais are generally men who work on the land and only mine when agriculture is out of season. The mines are situated high up so that the men are breathing deeply when they get to them ; as the road-ways of the mines travel through rocks containing quartz they experience considerable exposure to dangerous dust They are known to contract silicosis, for which compensation is awarded Claims are established on post-mortem findings. Examinations of 173 reports on autopsies disclosed 40 of men who had been exposed to the dust hazard for 2 years or less, either in continuous employment or whose 2 years were made up in spells of varying length.

Information regarding these 40 cases is the subject matter of the present study , it is subjected to every possible combination and permutation of statistical enquiry. The data are insufficiently numerous to justify more than a few simple deductions Thirteen cases support the conclusions that pure silicosis, without any superimposed tuberculous infection, can occur at any stage of severity, and that it can occur after dust exposures of not more than 6 months The presence of tuberculosis undoubtedly hurried on the silicotic process. Young men showed a definite trend to developing the trouble with less exposure than older men, and the condition progressed faster than with older men, some 5 years faster for advanced cases Once the silicotic process was set going it appeared to advance and to be irreversible ; nothing could be done except to minimize the exposure; breaking the period up into spells had no effect. Length of time since the detection of the trouble was positively correlated with the stage of advance. [No attempt was made to determine the dust concentrations and their variations.] *E. L Collis*

VIGLIANI, E C. Aspetti della silicosi delle industrie minerarie italiane **[Aspects of Silicosis in the Italian Mineral Industry]** *Arhiv Hig Rada* Zagreb 1953, v. 4, No. 3, 383–9 [10 refs.]

Our knowledge of miners' silicosis is due in great part to research workers in Britain, Germany and South Africa ROVIDA, an Italian, was the first to use the term "silicosis" when describing pathological changes in a flint worker. It is now acknowledged that disabling silicosis may be caused by dust with as low a quartz content as 1 1 or 2 per cent or even in the absence of free silica

In Italy, the law prescibes a yearly medical and X-ray examination of all workers in quarries, mines and tunnels, and much is known about the incidence and aetiology of silicosis as a result But no other statutory requirements are laid down for prevention, … can only with difficulty … ssion … those … xcava- … re the … shor … ied in 1949–52 have been studied and found to show a 2… per cent incidence of silicosis and a 12 4 pe… cent incidence of reticulation ["pinhead mottling"] 1 1 per cent. of the subjects showed signs of tuber… culosis which was definitely, or suspected to be, active… 3,303 of the subjects were over 35 years old and had been exposed to the hazard for more than 10 years Of these, 17 1 per cent showed pinhead mottling 8 2 per cent silicosis and 1 9 per cent. tuberculosis Slate quarries showed the particularly high silicosis incidence of 9·3 per cent ; slate contains only 5 to 10 per cent quartz, but its particles are extremely small, less than 10μ This contrasts with ochre which may contain up to 25 per cent free silica in coarse particles; old grinders of ochre show much pinhead mottling which seems, however, non-progressive

Among 17,541 miners, the drillers show a much higher incidence of pinhead mottling 12 5 per cent, silicosis 8 5 per cent. and tuberculosis, active or suspected, 2 4 per cent Corresponding incidence rates of 5 1, 2 6 and 1 0 were found in other miners who work underground and 2 1, 0 7 and 1 4 among those miners whose task is carried out in the open air

The author recommends the use of dust extraction methods through hollow drills as a very effective preventive measure He considers that it is not a practical proposition in Italy to discharge miners away from their trade because of pinhead mottling or even for silicosis, unless this is complicated by tuberculosis Preventive measures aim mainly at dust suppression, and many undertakings have taken up wet drilling The Italian Government has appointed a Commission to consider new regulations for the prevention of silicosis among miners *J Cauchi*

FLORIS, M & FLORIS, G Lo stato attuale della silicosi in Sardegna **[The Present Incidence of Silicosis in Sardinia]** *Rass Med Indust* Turin 1952, Sept.–Oct., v 21, No 5, 381–401, 1 map & 1 chart [27 refs]

There is a considerable proportion of granite and quartz in Sardinia, where a wide variety of minerals are mined one might mention lead, zinc, arsenic, tin, granite and quartz itself among these minerals. There are also potteries of varying size down to small family undertakings

An account is given of the findings of a silicosis survey covering the years 1947–51 and involving the X-ray examination of 22,462 workers. Of these, 2,830 (12 1 per cent) showed varying degrees of reticulation, 770 (3 5 per cent.) showed nodular shadows, 232 (1 per cent) had massive involvement, 42 (0·2 per cent) had silico-tuberculosis and 56 others (0·2 per cent) were suffering from tuberculosis. Comparative figures for the Italian mainland give [illegible]

[illegible]

the Italian mainland

The paper discusses the factors of "intrinsic and extrinsic (equipment, etc.)" and of "potential and effective" risks in the mining industry in relation to silicosis. The latter is a serious disease because it involves irreversible tissue changes, tends to be progressive and is liable to become complicated with tuberculosis and with cardiovascular disease Little is available in the way of cure but much can be done to control the incidence of silicosis by means of preventive measures, of which hardly any have yet been taken in Sardinia Such measures should include medical examination on engagement and at regular intervals, the supply of water for wet mining, improved ventilation, dust extraction where required, personal hygiene, health education and industrial insurance to provide for compensation *J Cauchi*

MILIJIĆ, B Silikoza u rudarskom bazenu Zajača. **[Silicosis in the Mine of Zajaca]** *Higijena.* Belgrade 1954, v. 6, No 1, 52–7.

The English summary appended to the paper is as follows —

"The author presents the results of investigation of silicosis in the mine of Zajača By chemical analysis it was ascertained that in the ore—antimony oxide—there is 38 4% free SiO_2, 2 23% bound SiO_2 *and 41 63% total* SiO_2 *In kalcit there is 2 9% free* SiO_2, 1 92% bound SiO_2 and 4 82% total SiO_2 335 miners were examined from among 557. In 270 cases radiography of the lungs was carried out. It was found [illegible]

"7 [illegible]

from [illegible]

nodul[illegible]

fluens, and 2 2% from silicotuberculosis.

"At the end the author suggests measures to be taken as medical and technical protection"

MAROCHINI, V & KUIŠ, M Silikoza u rudniku kremenog pijeska Saulaga kod Pule **[Silicosis in the Silica Sand Mine near Pula]** *Arhiv Hig. Rada* Zagreb 1955, v 6, No. 1, 11–22, 1 map

The English summary appended to the paper is as follows —

"An examination of miners in the silica sand quarry Saulaga in Istra has been carried out The quarry layers contained 98% of free silica

"Out of 144 miners and workers exposed to silica dust 23 cases of silicosis *were found; 15 cases* presented uncertain findings In evaluating the roentgenograms the American grading according to Pendergrass-Robert (1948) was used. The cases of reticulation without sharply designed micronodular shadows were classified as uncertain findings With regard to the length of employment the examined workers could be classified as young workers There were only 74 working at the quarry more than 3 years 31% of these workers were silicotics, and 19% showed primary silicotic changes. The heaviest exposure was suffered by workers performing pneumatic drilling operations The drilling operation generates a highly dispersed silica dust with average particle size of about 1 micron The concentration of dust was 30–40 times larger than the MAC Out of 30 drillers 20 suffered from silicosis, 5 showed uncertain findings, and only 5 had no silicotic changes.

"No personal or technical protective devices have been used in the quarry

"The authors discuss the way in which prevention of silicosis should be carried out. Suggestions for future work are given The necessity of a wide investigation into the problem of silicosis in Yugoslavia is emphasized"

there was sclerosis of the vessels of the heart and brain Among collagen fibres in the lung tissues dark-coloured dust particles were seen which sparkled when seen under dark ground in the phase-contrast microscope The diagnosis from pathological findings was silico-siderosis, substantially similar to that in the first case, but without tuberculosis.

Introducing the third case the author describes an investigation reported by MORITZ among workers employed in the iron and steel industry in the Saar where iron-ore from Lorraine was used Much dust was produced in the sinter departments where several hundred workers were employed Analyses of the dust from several works showed 56–59 per cent. iron oxides and 12–13 per cent silica, with lime and alumina Radiographs of 242 sinter workers showed, in 16 of them without previous dust exposure, signs of pneumoconiosis after an average of 7–8 years of work Reference is also made to a study by R ARNOLD on workers at the sinter departments of Westphalian iron-works, 38 of them showed slight changes of silicotic type after 12–14 years of work

The third autopsy was on a steam-crane worker, employed for 30 years in moving slag and furnace dust, he died aged 57, and an autopsy was made by GERSTEL The diagnosis was severe fibronodular silicosis, hypertrophy and dilatation of the right heart, and oedema and bronchopneumonia of the left lower lobe

The conclusion reached is that these cases showed mixed-dust silicosis, or sidero-silicosis, tuberculosis was found in only one The slow development of the silicosis was due to the low quartz content of the inhaled dust, and probably also to the high proportion of other dusts.

E L Middleton

WATSON, H H **The Dust Problem in the Kolar Gold Mines.** *Bull Inst Mining & Metall* London 1952, Feb 7, No 543 (*Trans I M M*, v. 61, Pt 5), 185–228, 5 figs [31 refs]

The author visited the Kolar Gold Field in July and August, 1949, to examine the problem of dust suppression in four of the extremely hot mines.

A pneumoconiosis similar in many ways to the pneumoconiosis of coal workers is common among the workmen of the Kolar Gold Field who have worked for long periods underground, but it is not very disabling unless complicated by tuberculosis The enhanced susceptibility to tuberculosis is the only important parallel with silicosis, as it occurs in the gold mines of the Witwatersrand.

The first part of the paper contains a discussion of the medical and environmental data available at the time of the author's visit. From these an attempt is made to derive a tentative scale of maximum permissible dust concentrations. The difficulties of doing this are very wisely emphasized, and it is pointed out that the figures given are purely arbitrary and based on inadequate data, so that later revision will doubtless be necessary as further data are accumulated The scale is based on the dust counts yielded by thermal precipitator samples when all particles visible under the high-power microscope are counted. For exposure for the full shift the dust counts in roadways and airways should not exceed 1,500, 1,000 or 500 particles per cc respectively when the quartz content of the respirable dust is under 15 per cent, from 15 to 50 per cent, and over 50 per cent The maximum counts recommended for the time when operations are in progress in development, stopes, and loading for the same quartz contents are respectively 4,000, 2,000 and 1,000 particles per cc.

Methods of dust-control are discussed with reference to the situation in the Kolar mines. The use of water must be severely restricted owing to the very high temperatures that prevail Attention is drawn to the value of fitting external sprays to the drills, and to the effect of the passage of oil spray down the hollow drill steel

There is some discussion of the use of the Pneumoconiosis Research Unit hand pump for routine sampling, but experience in the Kolar mines has shown that the calibration of the instrument is liable to vary widely

High dust concentrations were observed During drilling operations, for example, average dust counts of the order of 16,000 to 22,000 particles per cc were found, with individual counts as high as 30,000 particles On an occasion when some lubricating oil was poured into the compressed-air connexion to a drill, thus creating an oil mist, the dust count was only 5,450 particles per cc, as compared with 21,900 particles with dry-drilling Comparisons of dust concentrations during dry-drilling and wet-drilling show the great value of the latter in preventing dust

Dust samples obtained with a Soxhlet thimble sampler were analysed. Quartz had 87 6 per cent total silica, and schist had 53 3 per cent. total silica with no free silica

The relation between particle size and alveolar retention of the dust is discussed, and a calculated curve showing this relationship for dusts of the Kolar Gold Field and the Witwatersrand is given

The dust of the Kolar Gold mines seems to be much less hazardous than that of the Rand There is a suggestion that this difference may be related to the greater amount of calcium in the Kolar dust.

Thomas Bedford

INDIA, GOVT. OF. MINISTRY OF LABOUR. **Report No. 3. Silicosis in Mica Mining in Bihar.** pp. ii + 38, 8 figs (6 on 6 pls.) [30 refs.] 1953 Office of the Chief Adviser Factories.

India supplies the world with mica, the bulk of her production coming from the Bihar mines Silicosis is not yet on the Schedule of Occupational Diseases under the Indian Workmen's Compensation Act, one reason being lack of evidence as to its incidence The investigation on which this report is based is probably the first comprehensive study on the subject of silicosis in India

Analysis of 9 samples of rock drillings showed free silica contents from 11 per cent. to 67 per cent., the median being 42 per cent. Dust control was unsatisfactory and sometimes non-existent. Dry drilling [illegible] produced only 7 to 8 m p p c.f Attempts at dust removal at dry drilling by means of a compressed-air-operated exhaust draught were not successful. [illegible] classed as normal or showing linear exaggeration, 50·6 per cent showed a ground-glass appearance which was regarded as indicating definite changes due to dust, and 34 1 per cent showed nodular or conglomerate shadows The most dangerous work, as might be expected from the very high dust counts, was dry [illegible] miners, 39 supervisors employed underground were examined, of whom 15 (39 per cent) were found to have nodular or conglomerate silicosis

A series of recommendations is made which should [illegible]

HEIMANN, H , MOSKOWITZ, S., IYER, C. R. H., GUPTA, M. N & MANKIKER, N S **Silicosis in Mica Mining in Bihar, India.** *Arch Indust Hyg. & Occupational Med* Chicago 1953, Nov., v. 8, No 5, 420–35, 3 figs [Refs in footnotes]

India supplies the world with a large proportion of its high-grade sheet mica and the bulk of it comes from the Bihar mica field. In 1951 the production amounted to 195,000 cwt. There are about 27,000 mine workers in the industry, and of these 16,500 work underground

The mica miners are exposed to rock dust with a [illegible]

Before 1953 pneumatic drilling was carried on in some mines with no dust control. No mechanical ventilation was provided at any of the mines In some mines where water was not available dust traps were being introduced, but wet drilling was the method most frequently adopted in the control of dust With hand-drilling there are no dust control measures. "Mucking" (shovelling of rock) is done with no intentional dust control.

Dust samples were taken by means of the midget impinger. Dust counts ranged from about 1 million particles per cu ft in the general air to 1,700 million [illegible]

Attempts were made to compute the average daily [illegible]

Altogether 329 miners were medically and radiologically examined Of these, only 2 gave X-ray pictures which were classed as normal In 49 cases there was exaggeration of the linear markings, 166 [illegible] pictures showed nodular markings, which are diagnosed as stage 1 or stage 2 silicosis, and in 14 there were conglomerate shadows. The degree of lung markings increased regularly with increase in the time-intensity factor calculated from the period of exposure [illegible]

Pulmonary tuberculosis was found in 18 6 per cent. of the miners

Recommendations *were made which should assist* materially in reducing the hazard of pulmonary disease Only wet drilling should be permitted until the reasons for the ineffectiveness of dust traps are investigated, and the flow of water through a drill should be not less than ½-gallon per minute Wet drilling should not be done for more than 4 hours per day *unless there is sufficient mechanical ventilation* to keep the dust concentration below 5 million particles per cu ft After blasting, the surfaces of the working and the loose rock should be wetted. There should be

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India supplies the world with mica, the bulk of her production coming from the Bihar mines. Silicosis is not yet on the Schedule of Occupational Diseases under the Indian Workmen's Compensation Act, one reason being lack of evidence as to its incidence The investigation on which this report is based is probably the first comprehensive study on the subject of silicosis in India

produced only 7 to 8 m p p c f. Attempts at dust

lung") were also carried out In spite of comparatively short occupational histories of work in the mines, a very high incidence of silicosis, and of concomitant tuberculosis, was found Only 15 5 per cent were classed as normal or showing linear exaggeration, 50·6 per cent. showed a ground-glass appearance which was regarded as indicating definite changes due to dust, and 34 1 per cent showed nodular or conglomerate shadows. The most dangerous work, as might be expected from the very high dust counts, was dry

cent.) had this degree of silicosis In addition to the miners, 39 supervisors employed underground were examined, of whom 15 (39 per cent) were found to have nodular or conglomerate silicosis

HEIMANN, H, MOSKOWITZ, S, IYER, C. R. H, GUPTA, M. N & MANKIKER, N S **Silicosis in Mica Mining in Bihar, India.** *Arch. Indust. Hyg. & Occupational Med.* Chicago 1953, Nov, v 8, No 5, 420–35, 3 figs [Refs in footnotes]

India supplies the world with a large proportion

underground

Before 1953 pneumatic drilling was carried on in some mines with no dust control. No mechanical ventilation was provided at any of the mines In some mines where water was not available dust traps were being introduced, but wet drilling was the method most frequently adopted in the control of dust With hand-drilling there are no dust control measures "Mucking" (shovelling of rock) is done with no intentional dust control

Dust samples were taken by means of the midget impinger. Dust counts ranged from about 1 million

pictures which were classed as normal In 49 cases there was exaggeration of the linear markings, 166

intensity factor calculated from the period of exposure

Pulmonary tuberculosis was found in 18 6 per cent. of the miners.

... industry of Aberdeen numbering ... were seen ... liest stage ... oms The predominant feature was a hazy ground-glass appearance Silicosis to a certifiable extent was seen in only 11 subjects, 5 with nodular shadows, 4 with massive shadows, and 2 with silicosis and tuberculosis For the total population at risk this figure represents only 2·1 per cent with functional disability Work in Aberdeen goes on about equally in open and closed sheds, and the incidence of silicosis was the same in men working in the two types of shed Nevertheless, the men often change from one type to the other, and work in closed sheds represented a ...

... real extent of silicosis among the granite cutters occurs only in men at a late age, following in parallel with actual years of dust exposure Indeed, the disease progresses here so slowly and its functional effects are so belated, that the men may die at an advanced age without the disease becoming manifest Some excess of deaths ascribed to phthisis among the granite workers has been noted in mortality returns; but these deaths were found to occur before age 50, with a large proportion among young men between 16 and 30 years of age When compared with other Aberdeen occupations such excess was found occurring among workers grouped together instead of those separated by open air, such as fisher- ... may be due ...

BOUCHARD, A. Remarques sur les aspects médicaux de la silicose dans un chantier des Alpes **[Medical Aspects of Silicosis in a Stone Quarry in the Alps]** *Arch. Malad. Professionnelles* Paris. 1951, v. 12, No. 3, 319–21.

The author has been in charge for 2 years of the medical care of some 700 to 800 workers with exposure to silica dust. They work driving galleries through heterogeneous rocks, varying in composition from pure quartzite to limestone. The dust exposure is extremely varied, but 130 cases of silicosis came under observation. For a variety of reasons only 62 of these cases were useful for close study, too small a group for statistical purposes One had been employed for less than 3 years, 11 for 3 to 5 years, 16 for 5 to 10 ... 15 to 20 years and ...

... exhibited X-ray shadows of advanced fibrosis, ... showed nodules with a tendency to confluence, and the remaining 22 were intermediate with "snowstorm" shadows The author considers that, so far as work in these quarries is concerned, silicosis presents many obscure problems, with uncertainty regarding the composition and intensity of the dust exposure, and of the periods of exposure. Silicosis with less than 6 years' employment is unusual Acute or "galloping silicosis" is not seen. A diagnosis of silico-tuberculosis is rare *E. L. Collis*

RAYMOND, V., SIVADON, A. & CONIL, P. Les poumons des carriers et tailleurs de pierre calcaire. **[The Lungs of Quarrymen and Dressers of Limestone]** *Arch. Malad. Professionnelles* Paris. 1952, v. 13, No. 2, 169–78, 8 figs.

Radiological examinations were made of workers employed in quarrying and dressing limestone which ... mine. The ... nestone ... re that ... ise and ... gressive fibrosis but caused symptoms of only moderate significance The dust was, therefore, classed with those designated by GARDNER as inert.

... and quarry where the rock was ... ist was not ... sture. The ... and pneu- ... as airy but ... the amount ... of the stone ... these con- ... ilica 2 9 per ... total silica ...

... ually similar ... ions They ... ncreased in density; much increased broncho-vascular markings; vascular lines thickened, especially at the bases; calcified lymphatic glands; the ribs horizontal in position; and the aorta broad and unduly marked Clinically, signs of rhinopharyngitis, bronchitis and

emphysema were found in some workers; 2 or 3 showed signs suspicious of tuberculosis.

The appearances suggested some deposition of particles on the surface of the bronchi, increasing the opacity to X-rays; but radiographs taken of some workers a year after ceasing the work showed that the shadows had not cleared. The increased vascular shadows were not confined to the older men, but marked arborization was seen also in men under 30, and even in two workers of 16 and 17 years of age, with about one year's exposure. The prominent, broadened aorta also seemed to be a pathological change. None of the radiographs showed micro-nodular, nodular or pseudo-tumoral shadows, even in workers exposed for many years. The clinical picture suggested bronchial irritation with a tendency to emphysema. With regard to tuberculosis, of which only a few workers showed suspicious signs, it could not be said that the dust either accelerated or retarded development of the disease.

E. L. Middleton

SALTINI, M. Pneumopatie da polvere fra i lavoratori nelle cave dei Colli Euganei. **[Dust Disease among Quarry Workers in the Euganian Hills.]** *Med. d. Lavoro.* 1953, Dec., v. 44, No. 12, 512–19, 4 figs. English summary (6 lines).

The author gives brief mineralogical data on the various rocks which are worked in this area and describes the composition of various products from several representative quarries. These mining activities are carried out above ground and it was found difficult satisfactorily to measure and analyse the dust concentration in the atmosphere. Generally speaking, the atmospheric dustiness is moderate and the rock composition is markedly uniform for each quarry, but may differ considerably between neighbouring quarries. The proportion of free silica is relatively low, and in only one quarry was it found to be as high as 16 per cent. Some of the work is only seasonal.

A total of 708 workers have been X-rayed and the findings in 39 cases called for more detailed examination. Seven were found to suffer from [? pulmonary] tuberculosis or from heart disease. Careful clinical examination, including functional tests, of 23 suspected subjects revealed a loss of working capacity and suggested the presence of mediastinal changes, but the existence of silicosis could not be definitely confirmed.

J. Cauchi

BUCHER, J. Die Silikose der Granitsteinhauer im Tessin. **[Silicosis in Granite Workers in Tessin.]** *Ztschr. f. Unfallmed. u. Berufskrankh.* 1951 & 1952, Sept. 15, Dec. 15 & Mar. 15, vols. 44 & 45, Nos. 3, 4 & 1, 225–34, 300–312, 54–65, 1 fig. [18 refs.]

This is a detailed account of the results of investigations into the health of workers in the granite quarrying and dressing industry in the Southern and South-Eastern parts of Switzerland. The rock is quarried and dressed in the open air. It is composed of quartz, feldspar and mica, the quartz content varying from 20–40 per cent. of the rock in different localities. The data are based on the results of two radiological surveys of 779 workers, of whom 728 were exposed to dust in the occupations of quarrying and cutting granite blocks with hand and pneumatic tools; the final sawing and polishing processes were done by wet methods and did not expose the workers to dust; the amount of dust produced by pneumatic tools was greater than that with the use of hand tools.

The incidence of radiological changes in the lungs varied in different occupations: in stone cutters using hand tools it was 3.9 per cent.; in those using pneumatic tools it was 15.1 per cent. No silicosis was found in stone breakers using hand tools, but it amounted to 12.1 per cent. in those using pneumatic tools. The duration of employment had an important influence on the occurrence of silicosis and on the stage of its development; no pulmonary change was found in workers with less than 20 years' exposure; the first stage of silicosis was reached after about 28–32 years, and the advanced stages after about 35 years. Some evidence of tuberculosis was found in 12 per cent. of all workers examined; in the great majority of these the lesions were minimal and obsolete; such residual tuberculosis was found in 30 per cent. of the cases of silicosis, but in only one case was active tuberculosis diagnosed in association with silicosis; tuberculosis alone, in active form or as extensive healed lesions, was found in 7 cases.

The question is discussed whether workers with silicosis should be allowed to continue in the granite industry. Experience shows that the silicotic may continue to be fit for work in the industry, and it is difficult for the older workers to find employment in conditions free from dust. Younger workers showing signs of silicosis should be prohibited from using pneumatic tools; medical control, by periodical examinations, should exclude workers with pulmonary or circulatory disease, or with defective upper air passages. Technical measures should be undertaken to suppress dust. The miniature radiograph is regarded as capable of showing well marked changes, or advanced stages of the disease, but it does not show early or slight changes.

E. L. Middleton

STOJADINOVIĆ, M. & STOJADINOVIĆ, S. **Silicosis and Silicotuberculosis of Quarriers in the Region of Popina and Dublje.** *Arhiv Hig. Rada.* Zagreb. 1952, v. 3, No. 2, 137–63, 25 figs. on 13 pls. [42 refs.]

The paper is concerned with the health of stone-cutters and their families in two villages of the district of Trstenik in Serbia. There are large areas containing much mineral wealth where in the future extensive mining operations seem likely. The minerals can only be reached by penetrating rocks rich in free silica, hence there is a heavy potential silicosis hazard. The stonecutters who were the subjects of this

study produce millstones and building stones They dress the stones by hand. It is variously said that work is done in open sheds at the stonecutters' homes, even in winter, and also that the stones are dressed in the kitchen which is often the only room and in which the children are kept. In recent years some collective workshops have been organized, and these have porches for outdoor work. In individual work no protective measures are taken, except that some cutters moisten the stone.

A comparison is made between the tuberculin indices for primary schoolchildren in the two villages concerned and those for other villages with no stonecutting In Dublje and Popina, with developed stonecutting activities, the indices were 58 0 and 45 9 per cent In another with a smaller amount of stonecutting the index was 40 0 per cent., while the smallest indices in two villages with no stonecutting were 20·5 and 13·2 per cent.

Stonecutters were examined clinically. Of 219 who were examined out of the total of 260 cutters in the two villages, 125 were diagnosed as having silicosis and 43 as having silico-tuberculosis, leaving only 51 healthy Of those who had worked at stonecutting for over 25 years all had silicosis or silicotuberculosis, of those who had worked from 11 to 20 years 85 per cent. were so affected, and in those who had worked not more than 10 years 56 per cent were affected.

Silicosis was diagnosed in young children

Thomas Bedford

BUR

The English summary appended to the paper is as follows —

"From 1933 to 1948 inclusively 114 sandstone-

worked in Switzerland is very high, the silicosis of our stone-cutters does not run a bad course.

"Only a sandstone-cutter of 57·4 years of age, having been exposed to quartz-dust on an average for 37·7 years, declares himself ill The course of invalidity, which had been perused in 62 cases, gives essential facts as to the progress of the disease. The questions concerning compensations due to the diseased stone-cutters are shortly commented upon. The characteristic x-ray-findings in the case of sandstone-cutters are · hard nodules like calcifications and, later on, coatlike pleura indurations.

"As it is the case with other silicotics, tuberculosis is the complication occurring most often to diseased sandstone-cutters Despite silicosis and its complications, the sandstone-cutters reach an age above the average of the Swiss population.

"Immunity against silicosis: 20 sandstone-cutters contracted no silicosis in spite of long exposure to dust.

"As the workers are rather old when becoming aware of their disease, and the illness being relatively light, they hardly ever change their profession.

"Medical and technical prophylactic measures are

"A comparison with the silicosis of miners shows, once more, the benignant course of the silicosis of sandstone-cutters and founders."

PARMEGGIANI, L. La silicosi nei lavoratori della quarzite in Alta Italia [**Silicosis among Workers in the Quartzite of Upper Italy**] *Med. d. Lavoro* 1950, Nov, v. 41, No. 11, 289–315, *6 figs* [*23 refs*] English summary

Clinical and radiological examinations were made

a total free silica content of 96–99 per cent, it occurs in stratified formations and, from ancient times, it has been made into paving tiles and used as ornamental building material. Much of it is now ground and used in the manufacture of pottery and glass and as an abrasive. Some of the rock is got from mines, but most of it comes from open quarries. The workers at various processes in 16 factories and other undertakings were examined, at the smaller factories very imperfect means of suppressing dust were available, it is said that in the largest, and presumably more hygienic factories, the atmospheric dust counts, taken with the thermal precipitator, were all under 1,200 particles per cc. (35 million per cubic foot), and 75 per cent. were under 2 μ in diameter. [This is about 7 times the concentration regarded as a permissible limit]

In the 583 workers examined, radiographic changes were as follows (percentages in parenthesis): normal, 476 (82); increased linear striation, 23 (4); reticulation, 56 (9); nodulation, 33 (6); massive shadows, 9 (1·5); silicosis with active tuberculosis, 9 (1 5). Excluding those with increased linear striation, there were 107 cases of silicosis (18 per cent.) The incidence and severity varied in the different occupations, they were highest in the

women using hammers, also showed a high incidence

of silicosis Stone-dressers showed early signs only after 10–15 years' work and they usually remained at the reticulation stage even after 30 years, miners and quarrymen also showed a slow development of silicosis.

Active tuberculosis was found in 16 workers, inactive disease in 8 and evidence of primary foci, or healed pulmonary or pleural foci, in 51 cases The author compares the incidence of clinical tuberculosis, active and inactive, in quartzite workers (6 per cent) with those found in previous investigations in the same region and with similar climatic conditions among talc workers (1 2 per cent) and graphite workers (2 4 per cent) Comparing the incidence of pneumoconiosis in these industries the results were (including reticulation) quartzite, 29 per cent, graphite, 5 8 per cent, talc, 10 4 per cent, excluding the reticulation stage the corresponding percentages were 14, 1 9, and 1 8

Preventive measures to be adopted include mechanization of certain processes, enclosure of machines and localized exhaust draught, periodical radiographic examinations, and removal of silicotic persons from dusty processes *E L Middleton*

TROISI, F M Silicosi e silico-tubercolosi tra scalpellini di macine da molino, **[Silicosis and Silico-Tuberculosis in Mill-Stone Masons]** *Med d Lavoro* 1952, Jan, v 43, No 1, 9–19, 5 figs [11 refs] English summary

The results of clinical and radiographic examination of 66 men employed in making mill-stones from siliceous rock showed 14 cases of silicosis, beginning to appear in the micro-nodular stage after 9 years' employment, and 5 cases of silico-tuberculosis occurring after 16 years' employment

Two kinds of stone were used a highly siliceous, calcareous rock, obtained locally, with about 50-56

ranged from 1 to 30 years

The first manifestation of silicosis appeared

or silico-tuberculosis, except one man who was employed 16 years and gave a negative examination, but in 3 others, employed 2, 5 and 6 years, respectively, X-ray examination showed initial signs of silicosis, denoting, possibly, an individual susceptibility, thus, the workman employed 2 years was a mouth-breather, owing to chronic obstruction of one nostril Silico-tuberculosis was of slowly ingravescent, fibrotic type, 3 of the 5 affected men had been employed 16, 24 and 25 years, respectively

The method of prevention was by localized draught, applied by means of a metal hood connected by a

TROISI, F. M Silicosi in un rabbigliatore di macine di molino **[Silicosis in a Dresser of Millstones]** *Rass Med Indust.* Turin. 1953, Jan.-Feb., v 22, No 1, 23–7, 2 figs

Millstones have to be dressed by hammering with an appropriate tool whenever their surface has worn too smooth In Italy they are generally made of a very hard stone which comes from La Ferté in the *vicinity of Paris and which is sometimes combined* with local (Italian) stone the former contains about 89 per cent, the latter 56 per cent., of silica These millstones are sometimes made of a single block, but more often they consist of a number of trapezoidal sections held together by a special cement and bound round with iron tyres

The author gives clinical notes of a case of silicosis in a dresser of millstones, aged 59 years and with a 40 years' history of exposure to the risk. X-rays showed a reticular fibrosis with micronodular shadows The right side of the heart was affected.

Control measures are discussed These men often ply their trade travelling from one flour mill to the next and a portable, electrically driven, exhaust apparatus which such a tradesman can carry about, and which he can adjust to the particular portion of surface which is being worked, is suggested Certain other alternatives are discussed

A previous paper by the same author [this *Bulletin*, 1952, v 27, 670] dealt with the investigation *of 66 millstone dressers, of whom 5 had developed* silico-tuberculosis and 14 had uncomplicated silicosis.

J. Cauchi

STÜTZEL, H Feuerstein und Silikose **[Flint and Silicosis]** *Deut. Gesundheitswesen.* 1949, Jan 1, v 4, No 1, 12–14, 1 fig.

This paper was the result of the author's observation of two cases of silicosis in men who had been polishing

* See above

wood with abrasive paper. The abrasive was identified as flint, a microcrystalline aggregate of quartz crystals of average size of 1 to a few microns. Flint originated from gels rich in silica and it is a very brittle material, with sharp thin edges which easily flake off. It appears obvious that abrasive papers based on flint present a silicosis hazard, even when they are used to polish such soft materials as wood or leather. The use of abrasive papers with garnet, corundum or carborundum is possible and desirable *G. Nagelschmidt*

FEUILLETTE, P. & MARCHAND, M La silicose chez les broyeurs de galets de mer **[Silicosis among Men breaking Sea-shore Pebbles]** *Arch. Malad. Professionnelles* Paris 1953, v 14, No. 4, 399–401.

Pebbles on the shore of Pays de Caux and in the neighbourhood of Cayeux, both in the north of France, contain from 92 to 98 per cent. of silica These pebbles, when those containing iron, which can be detected by their colour, have been rejected, are crushed for use in a variety of industries Such uses include sand blasting, making foundry castings, polishing stones, hen food, sand-paper, and abrasive soaps, the powder is also added to the body of china and the "metal" of glass. A factory started to crush the pebbles in 1892 had to be closed because of the mortality among the workers, who named the place the abattoir

Some of the pebbles are broken up raw, others are first roasted A short description is given of crushing processes by horizontal or rotary crushers or breaking by steel hammers. Such apparatus quickly wears out, and 3 kgm of steel are wasted by one ton of pebbles The processes are rough and simple, generating dust throughout. Though men selecting and transporting the pebbles are not exposed to any dust, the men feeding and repairing the crushers are exposed The dust contains 90 per cent. silica and some silicates, for every 50 particles 3 microns in size and every 30 particles of 5 microns, there were 100 less than 3 microns

Details are presented of 10 men exposed to the dust who were afflicted with silicosis; 5 were dead and 4 also had tuberculosis The durations of exposure were mostly short, 2 to 6 years; only one reached 15 years The industry is a small one but it calls for every possible means of protection against the dust hazard *E L. Collis*

POLICARD, A & COLLET, A. **Deposition of Siliceous Dust in the Lungs of the Inhabitants of the Saharan Regions.** *Arch. Indust. Hyg & Occupational Med.* Chicago. 1952, June, v 5, No. 6, 527–34, 6 figs.

Sand, sand, silica sand covers vast areas of the Saharan desert, which is driven hither and thither by the winds in sand storms. By weight most of the sand is composed of particles too large to gain access to the pulmonary alveoli, but there are far more numerous minute particles, below 2 microns in size, fine enough to be carried into the upper strata of the air where they may be carried away into far lands. Such particles when inhaled can get into the depths of the lungs. Analysis shows the sand to be composed of 80 to 88 per cent. of silica, 2·5 to 4 6 per cent. of ferric oxide, and 7·4 to 9 per cent. of calcium carbonate. It is detritus of sandstone rocks. Fine air-borne Saharan dust contains quartz (demonstrated by X-ray diffraction); and in contrast to the sand itself, this fine dust passes through the air passages to reach the alveoli. Observations are [illegible]

[illegible] dust particles were found in the [illegible] peribronchial sheaths, similarly placed to dust in the lungs of coal or iron miners; histospectrograph[illegible] examination disclosed the presence of silicon in t[illegible] dust masses.

These fine dusts were also tested out by intr[illegible] peritoneal injections with only inert reaction, ju[illegible] as for such innocuous minerals as coal. Apparentl[illegible] these dusts, although composed of free crystallin[illegible] silica, are harmless to living tissues, and produce n[illegible] [illegible] years ago th[illegible] [illegible] t from freshl[illegible] [illegible] "old" dust [illegible] vith exposur[illegible] in the desert to hot sun by day and coolness by night. Another explanation is that the dusts of th[illegible] [illegible] which may come to coat the[illegible] [illegible]

MULLER, F. Un cas de pneumoconiose survenu après 30 ans de travail dans une usine de céramique. **[A Case of Pneumoconiosis occurring after Working for 30 Years in a China Factory]** *Arch. Malad Professionnelles.* Paris. 1951, v. 12, No 4, 432–5.

The case reported is that of a woman employed for 30 years in a china factory with only slight exposure to dust which contained few particles of free silica. She was apparently in good health until overtaken by influenza, which was followed by pulmonary tuberculosis After 2 years in a sanatorium with antibiotic treatment, she made a complete recovery, except that X-ray shadows did not clear away and that pronounced dyspnoea with a respiratory rhythm at 40 per minute, even at rest, persisted. Later diabetes appeared. The X-ray picture has remained unaltered for 3 years; it, with its accompanying dyspnoea, indicates the presence of a pneumoconiosis resembling silicosis Here is a tuberculous infection alongside a pneumoconiosis, both seeming to run separate and independent

courses. A careful enquiry into exposure to dust while at work did not disclose any silica risk, and it is possible that other dusts may have been responsible for the fibrotic changes in the lungs. The exposure to dust of free silica did not seem to be any greater than any farm labourer may experience who is accustomed to dig on dry clay ground. [The occurrence of pulmonary tuberculosis alongside the pneumoconiosis without either affecting the other would suggest that the pneumoconiosis was not a silicosis]
E. L. Collis

MULLER, F & CORCELLE, L. Sur quelques cas de pneumoconioses mixtes survenant dans l'industrie céramique [**Some Cases of Mixed Pneumoconiosis occurring in the Pottery Industry**] *Arch. Malad. Professionnelles* Paris 1955, v 16, No. 2, 149–53

Three cases of some interest are reported, they have in common that the patients had been employed for

work X-ray examination of the patients showed interstitial fibrosis with disseminated nodulation

ndustrial from the the pro- ntain 19 to 20 per cent of quartz, and the polarizing micro-

PROSPERI, G La silicosi nell'industria della porcellana [**Silicosis in the [Italian] Potteries**] *Rass Med Indust* Turin 1951, Mar–June, v. 20, Nos 2/3, 216–26 [15 refs]

The author has scrutinized the medical records of 2,000 employees from four well-known potteries in Tuscany, these factories produce ovens, electrical insulators and fancy china. The records cover the period 1947–50 and the author has personally examined some of the subjects He describes the layout of one of the most modern of these factories, the various stages of manufacture and the precautions, such as moistening of powders, wearing of

The author compares his findings with those of earlier research in this branch of industrial medicine, and he concludes that considerable advances have been made in protecting the health of the workers in an industry which still carries much occupational hazard
J. Cauchi

THOMAS, R W **Silicosis in the Ball-Clay and China-Clay Industries.** *Lancet* 1952, Jan 19, 133–5, 2 figs [10 refs]

china and earthenware, as well as in many other products China-clay is composed of kaolinite, potassium aluminium silicate, and contains only a

finally 3 years before he died he came under notice for dyspnoea and panting on exertion. X-rays showed classical silicosis in the third stage He became progressively worse and died accidentally from overdose of sleeping tablets Careful examination of the lungs disclosed moderately severe nodular silicosis, but the fibrosis in the nodules was less whorled than usual, there was no tuberculosis or

suddenly from fractured skull The heart muscle showed toxic degeneration, and the left lung a dense mass of tuberculo-silicotic tissue Small

respiratory disease among the workers does not seem to be abnormal, nor is disability arising therefrom
E L. Collis

KIRCH, E Die oberfränkische Porzellanstaublunge in pathologisch-anatomischer Beleuchtung. [**Pathological-Anatomical Aspects of Porcelain-Dust Lung in Upper Franconia**] *Beiträge z Silikose-Forschung* 1953, No 25, 1–29, 11 figs. [10 refs]

The author regards the porcelain-dust lung as a "mixed-dust" silicosis, since the porcelain mass is said to contain 9–32 per cent of free silicic acid He

has examined post-mortem material from 136 cases, including 6 women, between 1932 and 1945 *Among* these only 45 were cases of uncomplicated silicosis; in the remaining 91, including the 6 women, tuberculosis was superadded. Severe compensatable silicosis was *present in 35, and was accompanied by* cardiac hypertrophy which was practically always the primary cause of death, together with general wasting and bronchopneumonia. The average age of these *patients was between 50* and 73; *the* duration of work was 13 to 47 years, the period between initial symptoms and death varied from 10 months to 19 years.

In 10 of the non-tuberculous cases death was due to other causes such as carcinoma, coronary sclerosis or apoplexy.

Pathological Features

1. The right lung was 3 times as *frequently* involved as the left in severe cases, both with and without superimposed tuberculosis. In less severe grades, with tuberculosis, the left lung appeared to be more frequently involved.

2. Massive fibrosis, with a tendency to the formation of multiple indurated masses, varying from the [illegible] complete induration of one or [illegible] nodules, when present, were smaller than in other forms of silicosis and often surrounded by a wide thick layer of dust cells.

3 The indurated nuclei and the regional lymph nodes often showed a greenish or bluish coloration.

4 The distribution of the lesions differed from that typical of silicosis in that both upper lobes, often including the apices, showed the most marked variation

5 Chronic bronchitis, bronchiectasis and emphysema, and, more frequently than in pure silicosis, old pleuritic adhesions were commonly found.

6 Tuberculosis when present was usually of a progressive caseating character

The lesions described, especially the large fibrotic nodules, are well illustrated by photographs.

Ethel Browning

NOE, J. T. **Silicosis among Female Workers in the Pottery Industries.** *Indust Med & Surgery.* Chicago 1953, *June, v. 22, No. 6,* 255–8, 8 *figs.*

The process of fettling or finishing in the pottery industry is carried out by women It is simple. A stack of semi-dry, dishes is placed on a turn-table. While the stack revolves, a small spatula-like tool is pressed by hand against the edge of the dishes to *give a s*mooth finish. A cloud of fine dust is thrown off at breathing level of the worker; it contains from 35 to 50 per cent. of free silica Counts as high as 100,000 particles per cu. ft. of air have been found. Examinations of the women have revealed that their lungs show indications of silicosis But these women usually have been employed *for many years without experiencing* any symptoms or losing time for illness. Nevertheless the X-ray pictures, here reproduced, of 5 of these workers are typical of silicosis. Women well over 70 years of age are to be found working a 40-hour week and declining to retire or claim compensation for silicosis The 5 subjects instanced are aged 61, 54, 70, 53 and 73 There is no tradition of a tendency to succumb to tuberculosis in these women, as is so often a characteristic of those engaged with exposure to a silica hazard [The dust arises from ware that has been through the furnace Particularly dangerous silica dust predisposing to tuberculosis arises from newly fractured quartz]

E L. Collis

TROISI, F. M. & ZURLO, N. Sul rischio della silicosi in rapporto a polverosità ambientali di SiO_2 *ed anzianità di lavoro* in una *fabbrica* di ceramica. **[Silicosis Risk in relation to Silica Dust in the Environment and to Length of Exposure in a Pottery Works]** *Med. d Lavoro* 1954, *Nov., v. 45, No. 11,* 614–23, 6 figs. *English* summary.

The authors discuss the conditions and the manufacturing processes which they have studied *in a* factory where glazed tiles are made. The works employ 600 persons, of whom about 240 are women, and many of these workers have been at the same *task year after year· there have been no important* changes since the factory was opened 25 years ago The authors have measured the silica content in the materials which are handled and in the dust which *settles on* ledges and *other surfaces; they* have studied the dust held in suspension by the atmosphere inside the factory and measured its silica content, the average diameter of the particles and the number *of quartz and other particles per cc. of air* They found that both the clay and ingredients which go into the composition of the glaze contribute to this dust.

Only those quartz particles which have a diameter less than 5 μ are believed to have any pathogenic action, and the atmospheric concentration of these was found to be of the order of 196 per cc. at the clay grinding, 113 at the presses, 75 at the glaze grinding and less than 30 per cc elsewhere

Each employee had been X-rayed every year but no cases of silicosis had been found. The authors selected 22 employees who had worked at the same task for over 20 years and found 3 cases of *early* silicosis following a clinical and radiographic examination; 2 of these subjects had worked at the presses and the third was a clay grinder It is mentioned that at the Silicosis Centre, Stoke-on-*Trent*, pottery workers are subjected to routine X-ray examination from the fifteenth year of exposure onwards.

Control measures are discussed in this paper.

J. Cauchi

BARSI, C. La silicosi nell'industria delle mattonelle **[Silicosis in the Tile Industry]** *Rass Med. Indust* Turin 1953, Nov.–Dec., v. 22, No 6, 351–9 [15 refs]

The stages of manufacture in a particular factory are outlined—from raw material to packing—more especially with reference to the resulting atmospheric dustiness in each department. With a thermoprecipitation technique, measurements showed from 350 particles per cc. near the stamping machines to 180 particles in the checking and packing sheds. Two separate samples of raw material were analysed and gave 55 38–53 16 per cent. silica, 22 83–22 04 per cent aluminium oxide, 8 53–8 16 per cent. iron oxide, 1 24–3 00 per cent. calcium oxide and traces of magnesium oxide

Of 175 workers examined, 84 showed silicosis, 4 had tuberculosis and another worker had silicosis complicated by tuberculosis. Classifications are tabulated to show percentage incidences of the development of the disease, type of job and length of exposure to the hazard, according to the stages of the disease The clinical and X-ray features in these cases show some departure from the usual picture of silicosis and Barsi concludes that he is dealing with cases of generally moderate silicosis due to the density, as much as to the silica content, of the dust in the atmosphere In only 2 (1 1 per cent) of the non-tuberculous cases had the silicosis reached a massive, confluent stage, though 46 of the workers examined had been exposed to the hazard for over 30 years.

Barsi indicates broadly what preventive measures are advisable against the dust hazard, and a number of these had already been adopted in recent years by the firm involved.

J Cauchi

KEPPLER, J. F. & BUMSTED, H E **A Dust Study of the Building Brick Industry in Indiana.** *Arch. Indust. Hyg & Occupational Med.* Chicago. 1950, Dec., v. 2, No 6, 735–41.

This study was made in 22 plants in Indiana manufacturing only building bricks from clay or shale, or a mixture of these Dust sampling was carried out with midget impingers at all the processes, these included, with variations of method in different brickworks, handling, crushing and screening the raw materials, mixing and pugging with water, extruding, cutting and stacking the green bricks and drying them in tunnel driers, the dried bricks were fired in beehive or continuous kilns, sand being used as a parting material, the fired bricks were unloaded from the kilns by hand

Of 296 atmospheric dust samples taken with the impingers the dust counts ranged from 5 million to over 7,000 million particles per cubic foot of air [equivalent to 175 to 245,000 particles per cubic centimetre of air]

Analyses for free silica showed this to be present in the clays and shales from 23 to 52 per cent. The free silica content of the air-borne dust was assumed to be essentially that of the clay or shale used, the average figure being 22 6 per cent.

The conclusion was that the dust concentrations were well above the allowable limits, and there was need for dust control in the entire industry. Recommendations included wetting raw material, enclosure and exhaust of machines producing dust, and dust collecting devices incorporated in the ventilation system, portable exhaust and the use of washed sand as parting material at the kilns; cleaning at regular intervals, and protection, by approved respirators, of workers engaged in cleaning.

[Conditions as described appear to be dangerous and measures for dust suppression are called for, but without information on particle size distribution in the atmospheric dust, and on the health of the workers, a true assessment of the degree of risk cannot be made.]

E. L Middleton

PERETTI, L & OCCELLA, E. Il ruolo silicotigeno dei materiali argillosi **[Silicosis Hazard in the Working of Clays]** *Med d. Lavoro* 1954, Dec., v 45, No 12, 700–714 [49 refs] English summary

The joint authors of this paper are teachers of mineralogy and applied geology and of petrography and mining They discuss the formation, the chemical composition and the molecular structure of a variety of clays and clay-containing minerals which are used in such industries as brickworks, potteries, foundries, the manufacture of refractories and of cement In judging the silicosis hazard of handling such clay materials, their various properties have to be taken into consideration such are the content of free silica, more particularly the crystalline form, the size of the particles and their liability to be easily given off and diffused and to be inhaled by those working in the affected atmosphere The minerals with which we are here concerned are sedimentary formations which are derived originally from primary rocks by processes of erosion, transport and settling, in the course of which they may have acquired an increased content of free silica The paper discusses various types of mineral concerned and its association with other geological formations, its origin and development, as affecting the original and the final content of free silica

Because of fine structure and complex composition of these clay materials, their chemical and petrographic analyses are often not sufficient for an assessment of their likely rôle in causing silicosis or other pneumoconiosis, and other determinations (thermal, X-ray, electro-dialytic and other techniques) may have to be undertaken

Clinical and other evidence suggest that the property of free silica of causing fibrosis in the lungs is enhanced when certain hydrosilicates are associated in the atmospheric dust.

J. Cauchi

DESOILLE, H., TARA, S., DELPLACE, Y. & CAVIGNEAUX, A. Silice alcalin mouillant Possibilité de silicose galopante **[Silica in Alkaline Spray. Possibility of Galloping Silicosis]** *Arch. Malad Professionnelles* PARIS. 1953, v. 14, No. 3, 279–83.

The case put forward is that silica in an alkaline medium acts upon pulmonary tissue more acutely than ordinary silica. The idea first arose from animal experiments which indicated that extremely small particles of silica dust not aggregated by aerosols and so thrown on to the bronchial walls to

spray who presented pronounced pulmonary signs of commencing minute nodulation Case histories of 7 women and one man so exposed are given; they were followed up by periodic X-rays A scouring powder was used composed of 80 per cent silica, 15 per cent sodium carbonate, and 5 per cent. moistener; 80 per cent. of the particles were 1 micron or less in size. The X-rays showed silicosis appearing unusually rapidly and distributed fairly evenly over the lungs, and progressing quickly to micro-nodulation. Measurements of the dust-exposure at different processes are stated, and so are the steps which are being taken to control this dust and to introduce closed-in apparatus *E. L Collis*

PRINGLE, M. A **Silicosis in Secondary Industry.** Case Report. *South African Med. J.* 1954. Oct. 30, v. 28, No 44, 924. 1 fig

This is a report of a case in a man who worked in the South African gold mines from 1927 to 1941, and then left them, with a clear chest X-ray. He worked from 1943 to 1947 in a mill grinding quartz for the manufacture of scouring powder, and presumably contracted at that work the extensive silicosis from which he suffered. *Charles Wilcocks*

JENSCH, G Die Staublunge der Emailarbeiter **[Pneumoconiosis of Enamel Workers]** *Beiträge z. Silikose-Forschung.* 1953, No 23, 1–58, 3 figs. [20 refs]

The paper gives an analysis of the dust risks in the enamelling industry this industry has increased very much in size during the last 40 years in Germany

The work is based chiefly on a review of the literature and on a search for compensation cases The raw materials and processes used in enamelling are described in detail. It appears that spraying and dusting are the most dangerous occupations, followed by milling, whereas in mixing and smelting there is usually no dust risk. The quartz percentage in spray compositions may reach 40 per cent. or more

The scanty medical literature on silicosis of enamel

MEURES, K. Staubgefahren im Emaillierwerk. **[Dust Hazards in the Enamel Industry]** *Staub* Dusseldorf· 1954, June 15, No. 36, 260–63.

Vitreous enamels may contain between 20 and 80

spraying appears to be particularly hazardous

Improvements in conditions may be achieved by better ventilation and dust-extraction equipment, by use of respirators, and by segregation of dust-producing processes Investigations of the silicosis hazard are made difficult because few workers remain for long in one employment. *R. L. Gordon*

SCHRAMM, H. Die Steinstaublunge der Achatschleifer. **[Pneumoconiosis of Agate Grinders]** *Zent f. Arbeitsmed u. Arbeitsschutz* 1951, Sept, v. 1, No 5, 105–8, 3 figs.

The small semi-precious stone industry in the Nahe valley in Western Germany, where mainly agate is ground and shaped, can be traced back to th sixteenth century. Up to 20 or 30 years ago grindir was chiefly carried out by men lying on hollowe wooden supports, usually two men lying with the heads closely together, holding the objects to b ground against very large revolving sandston

Although general living and working condition have been greatly improved since that time, grinding is still carried out on sandstones In order to ge information about silicosis incidence a radiologica survey was carried out by mass radiography on 31 grinders, full-size pictures were taken of all suspected cases of silicosis or tuberculosis As the survey was carried out during the war there was a preponderance of older men in the group A condensation of the results given in detail in the paper is as follows —

Silicosis stage

Number of years at work	0	0–1 and 1	1–2 and 2	2–3 and 3	% disease
<20	42	2	—	—	4 5
21–30	53	—	2	3	8 6
31–40	111	4	5	2	9 0
41–50	63	2	3	1	8·7
51–64	17	2	2	1	22 7
TOTAL	286	10	12	7	9

GILJE, O Arsenmelanose og silikose hos glassarbeider. **[Arsenical Melanosis and Silicosis in Glass Worker]** *Nordisk Med* 1951, Oct. 24, v. 46, No 43, 1606–8, 3 figs

The English summary appended to the paper is as follows —

" A case of chronic arsenical melanosis in a man who had been employed as a glass worker for about 14 years is reported. The most characteristic symptoms of arsenic poisoning appeared about one year after the patient had changed occupation. He had to give up his job as a glass worker because routine examination of the chest had revealed a bilateral infiltration of the lungs interpreted as

UYTDENHOEF, A Recherches sur les risques de pneumoconiose dans les centrales électriques **[Researches on the Risks of Pneumoconiosis in Electricity Generating Stations]** *Arch Belges Méd Sociale, Hyg, Méd du Travail et Méd Légale* 1950, Oct, v 8, No 8, 526–9

Workers in certain processes at electricity generating stations are exposed to dust of coal, ash and soot, investigations have been made by the Belgian Medical Inspectorate of Labour to determine whether there is a risk of pneumoconiosis

The ash and soot contain up to 53 per cent. of silica in the combined state. Dust estimations made with the Owens settlement dust-counter showed concen-

exposed to the dust for at least 10 years The majority

dusty occupations Clinical examination showed emphysema in 10, and changes in respiratory sounds in 24, abnormal heart beat was found in 7, enlargement of the heart in 6, and adventitious bruits in 14 The radiological examinations were carried out at several centres and by different examiners so that it was difficult to classify results, they may be given as follows 108 normal, 36 increased hilar shadows; 13 non-specific sclerosis, 26 increased striation; 17

important in kind but they were few in number While it is not denied that the changes could be caused by exposure to dust it may be concluded that the processes in electricity generating stations do not expose the workers to a risk of serious pneumoconiosis This conclusion is supported by the fact that some of those examined had been previously employed in other dusty industries, a fact which emphasizes the importance of complete occupational histories in all investigations of this kind

E. L. Middleton

FISHER, R E W **The Medical Problems of the Gas Industry.** *Trans Ass Indust Med Officers* 1952, Apr, v 2, No 1, 22–9

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DICKMANS, H. & SCHMIDT, O Rontgenologische Untersuchungsergebnisse bei Kokereiarbeitern. **[X-Ray Investigations in Coke Workers]** *Beitrage z Silikose-Forschung* 1953, No 21, 35–54, 3 figs. [16 refs]

Generally speaking, the only coke workers liable to dust injury are those employed as oven masons, dealing with fireproof stone in repair and building operations. The authors have investigated 113 coke workers, 93 employed chiefly as oven masons, and 20 non-oven-workers, including some with more than 20 years' employment and of the highest age-group. In the whole group, 61 showed no dust variations in the lungs, 23 increased striation, 26 early silicosis, 2 early to low-grade, and 1 Grade I–II. Among the oven masons, 50 showed no change, 19 increased striation, 21 early silicosis, 2 Grade O–I, and 1 Grade I–II.

Most of those affected had worked over 20 years, and though the numbers of non-oven workers were too small to be conclusive, the authors suggest that the danger from dust inhalation in these men is not significant The larger number of cases in the oven workers is explained by their use of stone containing quartz and silica In 24 cases there were signs of inactive tuberculosis

In 100 of the 113, radiography was repeated by the direct enlargement technique, by means of ZORN's method of hard X-rays (100–120 K.V.) with a fine

This technique is specially valuable in demonstra-

order, emphysema, early congestion, polycythaemia and deposition of dust and soot The authors believe that a definite diagnosis of "pre silicosis" can be made only in the presence of reticulation, especially in the middle and lower lobes, and slight nodulation Hilum enlargement is absent in many cases, especially in older workers

This is facilitated by the enlargement, which gives good contrast detail of increased striation, reticulation and the finest nodulation, which are often not clearly visible with the usual radiographic technique

Ethel Browning

ARNOLD, R Der Gichtstaub. **[Flue Dust]** *Arhiv Hig Rada* Zagreb. 1954, v 5, No 2, 213–20, 8 figs (6 on 3 pls)

The paper gives a short report on silicosis in men exposed to blast furnace flue dust In the plant concerned the ore is sintered before it goes into the blast furnace. Flue dust rich in iron is recovered from the blast furnace and added to the ore before sintering. Most of the flue dust is below 5 microns in size. Analysis showed 15 6 per cent total silica for the flue dust and the author concludes that the dust may therefore contain 1 to 15 per cent of quartz.

A total of 9 crane drivers and 29 men working on the sintering plant who were exposed to the flue dust were examined clinically and by X-ray Five cases of early stage 1 silicosis were found. Three of these men had histories of other dust exposures, but two men with working histories of 12 and 14 years in the sintering plant had not been exposed to dust previously. No disability was found.

It is concluded that blast furnace flue dust can cause silicosis and that men exposed to such dust should be X-rayed initially, and periodically at intervals of 2 or 3 years *G. Nagelschmidt*

HARDING, H. E. & MASSIE, A. P **Pneumoconiosis in Boiler Scalers.** *Brit. J Indust. Med* 1951, Oct., v. 8, No 4, 256–64, 11 figs [11 refs]

The boilers of most steam-ships are scaled every ... work in confined spaces where

free silica. The post-mortem findings are now reported of 9 boiler scalers who had followed their occupation for 44, 30, 40, 30+, 30, 25, 17, and 27 years. Their occupational and case histories are given, together with X-ray and microscopic illustrations of the appearances of their lungs. In 4 cases pneumoconiosis was present, of sufficient severity to be a factor in the cause of death Two had bronchial carcinoma, one had tuberculosis. The type of pneumoconiosis was similar to that seen in South

radial and not whorled; the type ... dust fibrosis No evidence was found that such lesions were invariably caused by added tuberculosis, but it is reasonable to accept that local respiratory infections, tuberculous or other, played a part in the development of the fibrosis Focal emphysema, increasing with length of employment, was a feature

occurs among boiler-scalers and causes ... some 30 years of exposure.

E L. Collis

DUNNER, L., HICKS, M S & BAGNALL, D J. T. **Pneumoconiosis in Boiler Scalers.** *Brit J Tuberculosis* 1952, Jan, v. 46, No 1, 43–9, 8 figs on 2 pls.

The authors review their findings in 25 men, all

sometimes tending to coalesce with the formation of

DUNNER, L & HERMON, R **Further Observations on Pneumoconiosis in Radiator and Boiler Finishers.** *Brit J Radiol* 1952, Nov, v 25, No 299, 606–8, 10 figs

Radiator and boiler finishers scrape and clean castings previously moulded in a mixture of sand and

of their chests of old and now are given to demonstrate progressive deterioration which was particularly

E. L. Collis

DUNNER, L Pneumokoniose bei Reinigern von Schiffskesseln. **[Pneumoconiosis in Ships Boiler Scalers]** *Med Klin.* 1952, May 23, v 47, No 21, 706–9, 7 figs

In this article the author summarizes the results of his well-known work among the boiler scalers at † Hull [see this *Bulletin*, 1944, v 19, 119, 1945, v 20,

but graphic description of the conditions under which boiler scalers and flue cleaners work in ships. The working space is cramped and often hot and humid, the ventilation is insufficient, and the wearing of dust respirators can rarely be tolerated The dust given off when the scale is removed by hand chisel and hammer contains some free quartz, as well as particles of iron. Personal predisposition appears

symptoms. Four types of radiographic change are described increased striation, either general or localized, nodule formation, arranged along the striations, and again either general or local, and

* p 74 † v II, 269, 270

MOHNKE, W & FLEHMIG, R W Zur Häufigkeit der gewerblichen Silikose **[The Incidence of Industrial Silicosis]** *Deut med Woch* 1953, Dec 18, v 78, No 51, 1774–6, 2 figs

The paper draws attention to the relative frequency of silicosis in the post mortem material of a general hospital of an industrial town, outside any mining areas (Bielefeld)

Foundry workers, machine grinders and sand

Among 1,000 autopsies carried out between 1949 and 1951, silicosis was found to be a major contributory cause of death in no less than 16 cases

G Nagelschmidt

BUCKUP, H. & SCHMIDT, K. G. Die gesundheitsgefährlichen Staube mit besonderer Berucksichtigung der lungenschädigenden Stoffe. Überblick uber den Stand der Forschung **[Dusts Dangerous to Health with special reference to Materials producing Lung Damage]** *Staub* Dusseldorf 1950, Oct 15 & Dec 15, Nos 22 & 23, 257–80; 403–19 [Numerous refs]

This is a review based largely on German work of the last 20 years but written in fairly full knowledge of recent British, French and American work It provides a useful summary of known facts and theories among which the following may be mentioned: the upper size limit of harmful particles is placed at 3 to 4 microns; all dusts are harmful if inhaled for long periods of time in large quantities, but a special risk attaches to quartz Silicosis is defined as a particular subclass of pneumoconiosis, and compensation payments for silicosis in Western Germany run at an annual rate of 45 million DM [£4 million].

Iron is increased in silicotic lung tissue, and the ratio Fe/Si increases with the size of confluent masses. It is still not known whether dust particles penetrate the alveolar wall only inside phagocytes or also as free particles New light on the mechanism of nodule formation is thrown by the work of KOCH (*Frankfurter z f Path*, 1949, v 60, S 58) who demonstrated the sequence: foreign-body granuloma, resorption granuloma, necrosis, fibrosis, nodulation, by subcutaneous injection of silica into rabbits The reaction of silica with proteins and lipoids demonstrated by the work of HOLZAPFEL in 1948 requires further study

Another part of the review deals with permissible dust concentrations and tabulates American, Russian, British and other data The effect of dust composi- [illegible]

G Nagelschmidt

GOODALL, K. L. & HARDWICK, P J. **Air-Borne Dust Conditions in British Wartime Flax Scutching Factories.** *Brit J Indust. Med.* 1951, July, v. 8, No 3, 161–78, 4 figs. [23 refs]

During the war, flax-growing in Great Britain expanded suddenly from 3 acres in 1931 to 74,000 acres in 1944. Flax is prepared for spinning by first "retting" or rotting it in water so that woody matter may be separated from the fibre by scutching. Formerly scutching was done by beating the straw by hand, which caused the generation of much dust; today machines with rotating beater blades are used to flay the straw to separate the fibre. Dust is thereby generated. Such dust has long been recognized as injurious when inhaled, first "mill fever" appears which is a passing attack of malaise lasting 2 or 3 days, and liable to recur after absence from work on holidays or for sickness. Similar mill fever is seen in cotton mills. Then after years of work, bronchial asthma develops, reminiscent of the [illegible]

[illegible] varied from day to day. Some samples were taken by thermal precipitation, and the microscopic appearance of such dust is illustrated; the particles were of a median size between 1·5 and 2 6μ and the counts from 42 to 28 3 per cc. Chemical examination indicated that free silica was present in an amount ranging from 4 4 per cent. to 12 7. Hence the proposition is advanced that flax-scutching presents a small but probable long-term silicosis risk. A maximum allowable concentration of 10 mgm per cub metre for air-borne flax-scutching dust is [illegible]

[illegible] prevalence of pulmonary tuberculosis, which is the rule wherever silicosis is present, while the clinical symptoms of bronchial asthma are quite dissimilar from those of pulmonary silicosis, but quite similar to those of the pneumoconiosis caused by dust from bales of cotton More information as to the composition of the scutching dust is wanted]

E. L. Collis

LANDWEHR Mineralogische Probleme in der Silikoseforschung **[Mineralogical Problems in Silicosis Research]** *Beiträge z Silikose-Forschung* 1950, No 9, 15–28, 9 figs

The paper gives a review of past work and future plans in applying mineralogical techniques to silicosis research Certification statistics had shown large differences in different mining districts although the [illegible]

[illegible] matrix of clay and carbonate had very little quartz in the finest fraction and produced little disease Pure sericite mica is harmless but in mixtures with quartz it is more dangerous

In following the dust composition at various distances from the place of dust production, it is found that alterations occur which are due to differential settling. This settling depends more on the shape due to cleavage, that is to say whether fibres, plates or isometric particles occur, than on the density of the particles. The quartz percentage may therefore increase or decrease, according to circumstances.

When this work is extended ... and che...

... by adding ... ...ged dusts may be possible. The effects of ultrasonics will be examined

Medicine and mineralogy link up closely in the study of tissue sections from silicotic subjects and in sputum investigations

Figures are ... chiefly ... te and some limestone. Further work in this field is required to differentiate between silicosis and siderosis.

G Nagelschmidt

DAUTREBANDE, L. Facteurs à envisager dans la genèse de la silicose [**Factors to Consider in the Production of Silicosis**] *Rev Med, Minière,* Douai 1952, v 5, Nos 19/20, 5-20 [189 refs]

Many influences determine the genesis of silicosis. *Some* are fundamental and concern ... its content ...

... attributing more and more importance to particles of 1 micron and less, which are readily carried into the alveoli to be there brought into contact with the pulmonary tissues. Autopsies have shown that few particles larger than 1 micron are to be found in silicotic fibrosis Particles of less than 1 micron do not settle from the air, which is rarely still enough to permit of their sedimentation Moreover, they cannot be removed from the air by water-spray, and their detection in samples by analysis is difficult

The next important factor is the proportion of free silica in the inhaled dust. Some authors have claimed a direct relation between the amount of free silica and the incidence of silicosis but ...
established ...
if 1,700,00...
per cub ft ...
the United ...
in South ...
limit Ex... ..., however, that if particle-size, the proportion of free silica and the amount of dust, are kept constant, no correlation can be found between the length of exposure and the amount of silica detected in the lungs

Other influences from time to time come into play. They are styled occasional influences. They include the nature of other dust particles, such as coal or calcium Indeed, an accumulation ... through ...

... Diatom ... factors ... man, which ... person to another, a man performing heavy work will breathe deeply and so will tend to carry dust deep down into the lungs; some persons' nasal passages are more constricted than others, necessitating mouth breathing so that the dust particles escape the nasal filter, and go on to reach the deeper bronchial tubes, asthenic and delicate men are not easily trained to heavy work, and breathe more deeply than athletic men when under stress; they are therefore more likely to develop silicosis, Illness, such as tuberculosis, and fatigue will modify breathing and lung ventilation

Similarly the simultaneous presence of irritating fumes and gases in a dusty atmosphere will modify the passage of air into the lungs During quiet breathing, air, and with it dust, passes evenly into the alveoli, during gasping, the air goes irregularly, carrying dust into some parts where the lymphatic drainage may be overcharged, while other nearby parts remain dust-free. In fact, there are innumerable factors, including humidity and temperature, which will modify the entry of dust into the lungs and its disposition when it gets there. Hence arises the difficulty of attempting to define a limit of dustiness at which safety can be guaranteed. *E L. Collis*

PFEFFERKORN, G. Verbesserte Verfahren zur Untersuchung von Lungenstauben. [**Improved Methods for Investigating Dusts in Lungs**] *Arch. f. Hyg. u Bakt* 1951, v 135, No 1, 7–13.

As none of the published methods of isolating ... from lungs is satisfactory ...

... treatments must be ... several times. Endogenous salts are next removed by extraction with dilute hydrochloric acid. The residue is separated by sedimentation [in water?] into fractions above and below 1 micron, and the fraction above 1 micron may be further subdivided by centrifuging with heavy liquids This centrifuging is carried out in capillaries of about 2 mm internal diameter, and it must be done repeatedly to give complete separation. Dispersion in between centrifuging is done in an ultrasonic field and after the last centrifuging the capillaries are cut to separate the fractions.

Using this technique the author found that sericite recovered from lungs had a density of 2 4 instead of

2·8, and further studies demonstrated that organic

skins may cause visible effects in electron microscopy of lung dust. It is concluded that it is not possible to isolate mineral dust from lungs in a pure form without attacking the dust chemically. Organic skins on the dust are very tightly held and are increasingly important as the size of the dust particle decreases.

G Nagelschmidt

TURRIAN, H, GRANDJEAN, E. & NICOD, J. L. Une nouvelle méthode biologique permettant d'appré-

The method, carried out on rats, for testing the capacity of a dust to set up a fibrous reaction is to *inject 0 01 or 0 02 cc of a suspension of any* dust particles below 3 microns in diameter between the folds of the mesentery If quartz is the dust tested an isolated fibrous nodule is found at the site two months or so later. This nodule is isolated and weighed The weight is found to vary directly with the amount of dust injected and with the time since it was injected. Three different dusts were tested; quartz which provoked the heaviest nodules, oxide of titanium which provoked the least nodules; and kaolin which p

Histological
nodule had all
and that the
measure of the
oxide of titanium was purely cellular and reticulo-endothelial, without any tendency to fibrosis

E L. Collis

Occ

English sumary

Occella, the author of this paper, teaches petrography and mining at the Polytechnic, Turin. Here he reports on the examination of about 600 samples of clay materials used in industry; strictly, these were not all "clays" in the geological sense but included a wider variety of raw materials which have the property of becoming plastic and cohesive when moistened and subsequently dried, and which are used in foundry work and in the manufacture of bricks, earthenware and other pottery, refractories, cement and other products. In estimating the free silica in the samples, the research workers have used Durkan's technique and successively treated the materials with hydrochloric, phosphoric, fluoroboric and hydrofluoric acids. A few of the samples were of materials classed as "kaolins" and these were not followed up.

The author has graphically charted and tabulated the data showi
samples which
to their conten
10–15 . . . up
similar groupir
materials used
cent of all the samples

those where many of the particles are fine and, therefore, potentially silicotigenic [listed under (b-c)]

In a few of the analyses made, free "crystalline" silica was found in the form of chalcedony or amorphous intermediate stages of formation. Practically all the samples contained quartz, in varying proportions up to a maximum of 55 per cent, the average working out at 20 per cent.

From his series of analyses, Occella has found that

material may not necessarily hold for the atmosphe at the place of work where, on the one hand, baking of the ware may increase the temper of the materia so as to favour further subdivision of quartz and, on the other hand, the hazard may entirely disappear because the quartz reacts and combines with other oxides which are available at certain temperatures.

J. Cauchi

WAITZ, C Zur Pathophysiologie der Lungen-Fibro-
Komplı-
Patho-
special
ations—
Silikose-
Forschung, 1955, No 33, 31-60, 3 figs [40 refs]

In this article the author discusses the pathogenesis of fibrosis of the lungs produced by dust, both with
silico-
taken
ito the
osis or
discus-
which
many references are made.

After a brief survey of the processes which follow deposition of various kinds of dust in the lung, different theories regarding its possible mode of action are described New knowledge of the finest airborne

particles has been gained by the use of the electron microscope, and the extraordinary raggedness and

by mechanical processes must be considered as determining the irregular shapes and different electrical charges given to the particles, and attention is directed to the foreign body action on the tissues, and, incidentally, to the importance of dust suppression The mechanical effect and the irritation caused by this foreign body action on the tissues, owing to sharp angles, different electrical charges and irregular crystal surfaces, are referred to in quoted literature The solubility theory is examined and, in the light of recent experiments by HOLZAPFEL, is regarded as untenable Passing references are made to the influence of lattice structure, adsorption and surface effect, chemical action and the time factor. Functional and structural changes which occur in the tissues as a result of the irritation and the accompanying hyperaemia caused by the dust are described, and references are made to the effects of protective substances and of aerosol prophylaxis.

Tuberculosis is the most frequent complication of silicosis The views of many authors are cited on the pathogenesis of tuberculosis in the silicotic lesions and the influence of each disease on the course of the other, Boeck's disease appears to be accepted as a modified form of tuberculosis developing in a

derived from a pre-existing lesion or by fresh infection, and the irritating effect of the tubercle bacilli is added to that of the silica

However, examination of the tissue changes which occur in silicosis accompanied by cancer appears to show that such a relationship does exist SCHOCH reported from Switzerland a higher incidence of lung tumours in silicotic men than in others, although the numbers were small, it was also reported that silicosis accompanied by lung tumour had a worse prognosis than even severe silicosis with extra-pulmonary tumour WESTERMANN found among 13,904 autopsies of cases of silicosis 200 with cancer of the lung, most of these were in lungs with silicosis in the first and second degrees, and very much fewer in the third degree The explanation of this finding was that in the late fibrotic stage of silicosis less opportunity was afforded for hyperplastic growth than in the earlier stages The question whether silicosis prevents cancer must be answered in the negative The occurrence of cancer with a substantial degree of silicosis must be considered as a linked complication, and not as a disease *sui generis* For the purposes of compensation cancer accompanying silicosis in the first or second degree must be acknowledged as a complication, and after death both diseases should be regarded as one, in the award of compensation. *E. L. Middleton*

JÖTTEN, K W. & KLOSTERKÖTTER, W Die Bedeutung der Löslichkeit der Kieselsäure für das Zustandekommen der Pneumonokoniosen. **[The Significance of Silica Solubility for the Origin of Pneumoconioses]** *Arch. f Hyg. u. Bakt.* 1952, v. 136, No. 1, 1–4, 5 figs.

Experiments are described with an amorphous type of silica of 100 to 200 particle Å size. Dust inhalation in rabbits did not lead to specific lung changes in less than 22 months Later, small interstitial nodules were developed. These resemble the nodules seen in Boeck's sarcoid and in beryllium lungs rather than silicotic nodules Intratracheal and intraperitoneal injections of the same material into rats led to rapid death, in contrast to quartz in control animals

These results show that highly soluble silica compounds have a toxic action, in contrast to the less soluble quartz which has fibrogenic properties The silica solubility theory cannot therefore be so formulated as to say the higher the solubility the stronger the fibrogenic action The microscopic changes are illustrated.

G Nagelschmidt

KLOSTERKÖTTER, W Über Gefasswirkung kolloidaler und molekular geloster Kieselsaure **[The Action of Colloidal and Molecular Dissolved Silica on Blood-Vessels]** *Arch. f Hyg u Bakt.* 1953, v 137, No 1, 69–78, 4 figs [35 refs]

The literature on the early effects of silica being due to functional disturbances is reviewed Perfusion

whereas with larger doses it was larger and permanent It is said to be due to spasm and later to formation of oedema

Similar experiments were made with frogs, silica being injected into the lymph sac of the stomach or directly into the tongue. This led to complete stasis of the arterioles observed

The findings are discussed Colloidal rather than molecularly dispersed silica is said to be active and to cause contractions of the contractile elements which may affect the neuro-vascular system and lead to vascular spasm. *G Nagelschmidt*

2 8, and further studies demonstrated that organic skins still surrounded the sericite grains after all prev-

skins may cause visible effects in electron microscopy of lung dust. It is concluded that it is not possible to isolate mineral dust from lungs in a pure form without attacking the dust chemically. Organic skins on the dust are very tightly held and are increasingly important as the size of the dust particle decreases. *G. Nagelschmidt*

TURRIAN, H, GRANDJEAN, E & NICOD, J. L. Une nouvelle méthode biologique permettant d'apprécier la fibrogénité d'une poussière silicogène. **[A New Method for determining the Fibrogenicity of a Silicogenic Dust]** *Ztschr. f. Unfallmed. u. Berufskrankh* 1954, Dec. 15, v 47, No 4, 290–92

The method, carried out on rats, for testing the capacity of a dust to set up a fibrous reaction is to inject 0 01 or 0 02 cc of a suspension of any dust particles below 3 microns in diameter between the folds of the mesentery If quartz is the dust tested an isolated fibrous nodule is found at the site two months or so later. This nodule is isolated and weighed. The weight is found to vary directly with the amount of dust injected and with the time since it was injected. Three different dusts were tested; quartz which provoked the heaviest nodules; oxide of titanium which provoked the least nodules; and kaolin which provoked an intermediate reaction

Histological examination showed that the silica nodule had all the characteristics of silicotic fibrosis, and that the weight constituted a quantitative measure of the reaction The reaction provoked by oxide of titanium was purely cellular and reticulo-endothelial, without any tendency to fibrosis
E. L. Collis

OCCELLA, E Sintesi statistica di determinazioni chimico-petrografiche della silice libera in materiali argillosi **[Statistical Synthesis of the Chemical-Petrographic Determinations of Free Silica in some Argillaceous Materials]** *Med. d. Lavoro*, 1954, Dec., v. 45, No 12, 715–20, 2 figs. English sumary.

Occella, the author of this paper, teaches petrography and mining at the Polytechnic, Turin Here he reports on the examination of about 600 samples of clay materials used in industry; strictly, these were not all "clays" in the geological sense but included a wider variety of raw materials which have the property of becoming plastic and cohesive when moistened and subsequently dried, and which are used in foundry work and in the manufacture of bricks, earthenware and other pottery, refractories, cement and other products. In estimating the free silica in the samples, the research workers have used Durkan's technique and successively treated the materials with hydrochloric, phosphoric, fluoroboric and hydrofluoric acids. A few of the samples were of materials classed as "kaolins" and these were not followed up.

The author has graphically charted and tabulated the data showing, under (a), the percentages of all samples which fell into successive groups according to their conten [illegible] (0-5, 5-10, 10–15 . . . up [illegible] similar groupir [illegible] materials used [illegible] cent. of all t [illegible]

tore, potentially silicotigenic [illegible]

In a few of the analyses made, free "crystalline" silica was found in the form of chalcedony or amorphous intermediate stages of formation Practically all the samples contained quartz, in varying proportions up to a maximum of 55 per cent, the average working out at 20 per cent.

From his series of analyses, Occella has found that the silicosis hazard from any one material is directly proportional to the degree of subdivision of its particles of free silica and that this degree of subdivision may be inversely proportional to the total content of free silica But what applies to the raw material may not necessarily hold for the atmosphere at the place of work where, on the one hand, baking of the ware may increase the temper of the material so as to favour further subdivision of quartz and, on the other hand, the hazard may entirely disappear because the quartz reacts and combines with other oxides which are available at certain temperatures.
J. Cauchi

WAITZ, C Zur Pathophysiologie der Lungen-Fibrosen im besonderen der Silikose und ihrer Komplikationen—Tuberkulose und Krebs **[The Pathophysiology of Pulmonary Fibrosis, with special reference to Silicosis and its Complications—Tuberculosis and Cancer]** *Beiträge z Silikose-Forschung*, 1955, No 33, 31–60, 3 figs [40 refs]

[illegible] the author discusses the pathogenesis [illegible] dust, both with [illegible] ically in silico- [illegible] estosis is taken [illegible] further into the changes occurring in the tissues whe[illegible] tuberculosis or cancer supervenes in a silicotic lung. The discussion is based entirely on the literature, to which many references are made

After a brief survey of the processes which follow deposition of various kinds of dust in the lung, different theories regarding its possible mode of action are described New knowledge of the finest airborne

particles has been gained by the use of the electron microscope, and the extraordinary raggedness and

directed to the foreign body action on the tissues, and, incidentally, to the importance of dust suppression The mechanical effect and the irritation caused by this foreign body action on the tissues, owing to sharp angles, different electrical charges and irregular crystal surfaces, are referred to in quoted literature The solubility theory is examined and, in the light of recent experiments by HOLZAPFEL, is regarded as untenable Passing references are made to the influence of lattice structure, adsorption and surface effect, chemical action and the time factor Functional and structural changes which occur in the tissues as a result of the irritation and the accompanying hyperaemia caused by the dust are described, and references are made to the effects of protective substances and of aerosol prophylaxis.

Tuberculosis is the most frequent complication of silicosis The views of many authors are cited on the pathogenesis of tuberculosis in the silicotic lesions and the influence of each disease on the course of the other, Boeck's disease appears to be accepted as a modified form of tuberculosis developing in a special state of immunity The foreign-body irritation of silica-containing dust is the first link in the chain of events, to this follows, immediately and in many parts of the lung, a condition of peristatic hyperaemia, and the changes in the tissues favour the development of tubercle bacilli which may be derived from a pre existing lesion or by fresh infection, and the irritating effect of the tubercle bacilli is added to that of the silica

However, examination of the tissue changes which occur in silicosis accompanied by cancer appears to show that such a relationship does exist SCHOCH reported from Switzerland a higher incidence of lung tumours in silicotic men than in others, although the numbers were small, it was also reported that silicosis accompanied by lung tumour had a worse prognosis than even severe silicosis with extra-pulmonary tumour WESTERMANN found among 13,904 autopsies of cases of silicosis 200 with cancer of the lung, most of these were in lungs with silicosis in the first and second degrees, and very much fewer in the third degree The explanation of this finding was that in the late fibrotic stage of silicosis less opportunity was afforded for hyperplastic growth than in the earlier stages The question whether silicosis prevents cancer must be answered in the negative The occurrence of cancer with a substantial degree of silicosis must be considered as a linked complication, and not as a disease *sui generis*. For the purposes of compensation cancer accompanying silicosis in the first or second degree must be acknowledged as a complication, and after death both diseases should be regarded as one, in the award of compensation. *E L. Middleton*

JÖTTEN, K W. & KLOSTERKOTTER, W. Die Bedeutung der Löslichkeit der Kieselsäure für das Zustandekommen der Pneumonokoniosen. **[The Significance of Silica Solubility for the Origin of Pneumoconioses]** *Arch. f. Hyg. u Bakt* 1952, v. 136, No. 1, 1–4, 5 figs.

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G. Nagelschmidt

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... starch grains was tested by a technique which is described in full detail. The test involved counting many hundreds of cells with and without ingested starch on microscopic slides, and between 30 and 40 slides, including the controls, were counted in this work.

It was found that "aged" polysilicic acid with a high degree of polymerization distinctly inhibited mobility and phagocytosis, that freshly prepared polysilicic acid had very little effect, and that monosilicic acid had no effect at all on phagocytosis.

G. Nagelschmidt

ANTWEILER, H Untersuchungen zur Frage der akuten Organwirkung geloster Oligo- und Poly-Kieselsauren im Tierexperiment. **[Investigations on the Acute Effects of Oligo- and Polysilicic Acids in Animal Experiments]** *Beiträge z. Silikose-Forschung* 1954, No. 29, 17–52, 18 figs [25 refs.]

This is a long paper describing a number of observations on the pharmacological effects of silicic acids which have been to a surprising degree neglected in experimentation in the past. The object was to study the intermediate stages between dust inhalation and the occurrence of fibrosis of the lung tissue, but no close parallel was attempted

The work was carried out with colloidal silica solutions prepared from Aerosil or other sources, and although some analytical data on total silica are given the relative proportions of AMR (ammonium-molybdate reactive) and colloidal silica were not always known

The author refers to the equilibrium value of 100 μgm. SiO_2/ml. of AMR silica found by LUEHNING † [this *Bulletin*, 1955, v 30, 237].

A few data on the lethal dose of silica solution ...

lysis occurred

The ciliated epithelium of the mouth of frogs was tested by measuring the time taken by a piece of cork weighing 2 mgm to traverse a given distance. The time was found to increase with silica concentration until at 70 mgm SiO_2/ml. there was practically no movement.

Further work dealt with the effect of silica solutions on venules, arterioles and capillaries Very low concentrations (under 100 μgm SiO_2/ml) caused an initial contraction followed by an enlargement of the vessels and slowing down of circulation This is illustrated by various photomicrographs.

Perfusion experiments on isolated legs of guinea pigs and frogs also showed a slowing down of flow with increasing silica concentration from 25 μgm SiO_2/ml. upwards.

Isolated hearts of frogs showed no effects with 50 to 100 μgm SiO_2/ml. but showed reduced movement at a higher silica concentration.

Large intravenous silica injections were necessary to reduce blood pressure in anaesthetized rabbits and cats. Isolated guineapig lungs, however, perfused with silica solutions through the trachea, showed increased resistance to flow at very low silica concentrations (50 μgm. SiO_2/ml).

Contraction of smooth muscles by silica solutions was also demonstrated with frog lung and trachea preparations

All these observations are considered to be due to an astringent action (tanning) of the silica on the collagenous portion of the interstitial tissues of an irreversible kind.

The author considers it likely that quartz dust in the lungs can by dissolving build up silica concentrations above 25 μgm. SiO_2/ml., the lowest he found to have any effect at all, and this should initiate fibrosis of the lungs, especially if removal of the dissolved silica is inhibited by lymph blocking and compression of capillaries.

G. Nagelschmidt

FOUCAULT, G & COLLET, A. Comparaison de la dissolution de la silice *in vitro et in vivo* **[Comparison of the Solution of Silica *in Vitro* and *in Vivo*]** *C R Soc Biol* 1955, Mar, v 149, Nos. 5/6, 507–9

The accepted fact that silica dissolves in contact with aqueous solvents depends mostly upon observations made *in vitro*. Fine particles of silica in contact with living tissues may disappear not only by dissolving, but by other paths, such as the lymphatics In order to compare solution *in vitro* and *in vivo* a new method of observation was devised Fine particles of silica from condensed fumes, or particles below 2 microns in size from crushed quartz, were mixed with a paste of collodion in small plates or hollow cylinders Some of these collodion devices were introduced into the peritoneal cavity of rats and left for 21 to 34 days, others were kept for equal periods at 37°C in a medium of pH 7 4 The amounts of silica which had disappeared were then determined No difference was noted except a slight increase in the loss of silica in the *in vivo* observations; posibly the presence of protein matter in the living tissues accounted for this Certainly when proteins are added *in vitro* a similar increase in the amount of silica dissolved has been observed The finer the particles of silica the greater was the amount dissolved; otherwise no differences were detected in the two sets of observations [*See* also SCHEEL *et al*, this *Bulletin*, 1954, v 29, 383] ‡

E L. Collis

* p. 81 † Ibid ‡ p 93

GODBERT, A. L & HALPIN, R. K. **The Effect of Aluminium Salts on the Solubility of Quartz Dust and its Electrokinetic Properties.** *Safety in Mines Research Establishment.* [Portobello St, Sheffield] *Research Rept* No 116. 1955, Mar, 18 mimeographed pp, 3 figs [1s 3d]

"The chemical theory of the cause of silicosis suggests that it develops from the dissolution in the lung fluids of quartz dust and the toxic properties of the resulting solution of silica The addition of aluminium dust to a suspension of quartz in water is known to reduce the solubility of the quartz to a very small value This effect suggested that the inhalation of aluminium dust by a man whose work exposes him to the risk of silicosis might prevent or at least retard the onset of the disease The value of this aluminium therapy has not, as yet, been confirmed.

"In the present investigation, it is shown that the addition of aluminium salts to a suspension of quartz in water under suitable conditions of the pH value of the liquid and of the concentration of aluminium salt added has a similar effect in considerably reducing the amount of silica in solution

"The effect of aluminium dust on the dissolution of the quartz has been ascribed to the adsorption of aluminium on the surface of the quartz particles

mobility of the quartz caused by an aluminium salt occurs under a narrower range of conditions than does the large reduction in the solubility of the quartz The adsorptio
to be only a
the solubility
of the silica
some precipitation of the aluminium salts as aluminium hydroxide This suggested that the silica failed to appear in solution because it was removed from the solution by adsorption upon the precipitate of aluminium hydroxide rather than by a reduction in the solubility of the quartz itself This was confirmed by an investigation of the effect upon solutions of silica and upon partially dissolved quartz dust suspensions of the addition of aluminium salts Experiments made under varying conditions of the pH

HEFFERNAN, P **Further Thoughts on Silicosis.** *Tubercle* 1953, Sept, v 34, No 9, 246–9

The author discusses the reaction which takes place between particles of silica dust and the pulmonary tissues setting up silicosis He rejects the solubility theory which supposes that silica passes into a hydrosol, silicic acid, in the alkaline tissues; these tissues then enter into some chemical reaction with the silicic acid and silicosis results He propounds instead a surface valency theory. Both theories are essentially chemical in nature. The structure of *freshly* fractured silica is held to possess chemical surface activity with ability to coagulate and fix large masses of organic material The freshly fractured ends of asbestos are postulated to possess the same activity; hence asbestosis Freshly powdered aluminium added to fresh silica dust forms a protective coating over the silica particles to render them inactive and harmless A stream of silica particles has been noted to carry electrical charges; they may be regarded as solid ions

A smell may be noted in places where sandstone or quartzite is being dressed—the smell claimed by Ray Lankester to be the only known inorganic smell—similar to that in a badly ventilated X-ray room on

SCHILLER, E Zur Pathogenese der Silikose Loslichkeit plus Fremdkorperwirkung **[Pathogenesis of Silicosis: Solubility plus the Foreign Body Effect]** *Arch f Gewerbepath u Gewerbehyg* 1955, v 14, No 1, 1–9, 6 figs [Numerous refs]

On the question of the pathogenesis of occupational fibrosis of the lungs, especially silicosis, many theories have been put forward, but none of them has explained the mechanism of action between dust and tissue Several of the well known theories of the last 40 years are referred to, the last mentioned being that of JOTTEN & KLOSTERKOTTER [this *Bulletin*, 1952, v 27, 940]* who held that, probably, not only

again gaining more importance The series of experiments described was designed to examine the effects of insoluble foreign-body action along with very soluble silica

were killed after intervals of 30 and 60 days The results showed characteristic variation in susceptibility to the toxic action The first group (diamond dust) showed slight fibrosis and lymphocyte infiltration, and the dust scattered in the tissues, in the

* p. 79.

molecular symmetry (symmetrical crystals) are non-fibrogenic.

"3. Those tested crystals which do not possess a central point of symmetry (asymmetrical crystals) and possess piezoelectric properties are fibrogenic.

"4 Several materials previously untested biologically, selected for their physical properties, were tested and shown to be fibrogenic.

"5. Fibrous tissue reactions are considered to be stimulated by releases of energy in mechanical or electrical states within tissue."

III. "As piezoelectricity is a property of certain materials to transform energy in any direction between motion, heat, and electricity, each of these energy states requires separate consideration. When

such currents in tissue.

"1. Currents of electricity produced electromotively in tissues are capable of stimulating fibrotic reactions

"2. The magnitude of the reaction is proportionate to the voltage generated."

IV. "The fibrogenic potential of dusts is correlated with the piezoelectric activity of the dust."

Parmeggiani, L. Ulteriori osservazioni ad una rielaborazione americana della ipotesi piezo-elettrica di Velicogna sulla patogenesi della silicosi. **[Further Observations on an American Re-elaboration of Velicogna's Piezoelectric Hypothesis on the Pathogenesis of Silicosis]** *Med d. Lavoro* 1950, Apr., v 41, No. 4, 124–35 English summary.

The English summary appended to the paper is as follows.—

"An exposé is made of a series of objections

properties only at the molecular level In regard to the hypothesis of the piezoelectric pathogenesis of silicosis, the writer objects that the crystalline particles inhaled may only provoke very small piezoelectric effects, and that they may *receive in the organism* only very small hydrostatic stimuli, the electric potential is dispersed in the *cellular and interstitial liquids*, the dust is placed in the tissue without orientation, and consists of very irregular fragments which are not well suited to piezoelectric effects, very small electric phenomena are much diffused in the organisms, silicotic fibrosis does not appear in close contact with siliceous dust; silicosis also appears in non-contractible organs and favours the better protected areas of the lung; crystobalite, which is not piezoelectric, is perhaps even more pathogeneous than quartz."

Pratt, P. C., Bailey, D., Delahant, A. B. & Vorwald, A J. **Relationship between the Piezoelectric Property and the Fibrogenic Capacity of Dust.** *Arch. Indust. Hyg & Occupational Med* Chicago 1953, Aug, v. 8, No. 2, 109–17, 3 figs [Refs. in footnotes.]

Piezoelectricity is an electric polarization produced by mechanical strain, it occurs in most crystals which lack a centre of symmetry. Quartz is such a crystal The suggestion has been advanced that the fibrogenic property of certain dusts is dependent upon the phenomenon of piezoelectricity Experiments were undertaken to test this idea Three piezoelectric materials Madagascar tourmaline, barium titanate and sy

fibrosis or silicosis during a 2-year period of observation, similarly, the dust of barium titanate and of synthetic berlinite also failed to produce fibrosis or silicosis during a year of observation On the other hand, tridymite and amorphous vitreous silica, neither of which is piezoelectric, both produced fibrosis

The tissue reactions of a number of dusts are instanced; no relation exists between piezoelectric character and fibrogenic capability, or between non-piezoelectric character and fibrogenic capability The present studies may be accepted as *excluding* the piezoelectric phenomenon from further consideration in connexion with the fibrogenic *properties of quartz* dust or of other substances Another matter *is also* stressed, based upon experiments conducted at the

DALE, Jean C & KING, E. J. **Adsorption of Dyes, Amino Acids, Proteins, and Metal Hydroxides on Quartz.** *Arch Indust. Hyg & Occupational Med.* Chicago 1953, June, v 7, No. 6, 484-9

"The intention in these adsorption experiments was

prompt death of an animal receiving intravenous injections, was eliminated or very much lessened when the dye had been adsorbed on the surface of the particles We had also wondered whether the chronic-silicosis-producing effect of powdered quartz could be affected by adsorbed dye, amino acid, or protein, as it is by aluminum and iron hydroxides

"1 Only basic histological dyes were adsorbed by powdered quartz

"2 Alanine and arginine showed a slight adsorption on quartz. Cycline showed no adsorption.

"3 Protein from cerebrospinal fluid, ascitic fluid, and serum have been adsorbed on quartz, and maximum adsorption has been shown near the isoelectric point

"4 Adsorbed dyes had very little effect on the 'silica solubility' of quartz Of the metals which form insoluble hydroxides, only aluminum depressed solubility markedly"

KIEUTH, W & SCHLIPKÖTER, H. W Quarz und Blutserum Elektronenoptische Untersuchungen **[Electronmicroscopic Study of the Effect of Blood Serum on Quartz]** *Arch f Hyg u. Bakt* 1953, v. 137, No. 1, 53-60, 2 figs. [41 *refs*]

In connexion with a study of the silicotic process the effect of rabbit serum on quartz powder was examined. The rabbits had previously been given quartz intraperitoneally or intravenously The particle size range of quartz was 0 02 to 3 microns, and small particles were usually found adherent to the large *ones. After 72 hours' contact of quartz and*

demonstrate clearly the adsorption of colloidal silver, especially after addition of N/400 [illegible], on the edges and probably also *on the faces of quartz particles* If, however, the quartz had first been in contact with blood serum this adsorption was much reduced and after 72 hours in contact with quartz and serum it was completely inhibited *G. Nagelschmidt*

CLAEYS, C Recherches sur les réactions du sérum humain à la silice **[Investigations into the Reactions of Human Serum to Silica]** *Rev Med Minière.* Douai 1954, v 7, Nos 26/27, 22-30 [44 refs]

A short summary is given of the various theories propounded to explain how silica exerts its harmful action on living tissue The reaction is generally thought to be a chemico-physical one Certain tests were made with colloidal silica and with crystalline silica They showed that when the refractometric reaction was positive, the reaction of viscosity was also positive, but the inverse was not always true. The reaction seemed to be due to gamma globulins. Complement did not play any important part. The state of the silica was important, the small particles exerting a strong influence and the freshness of fracture being even more important Such crystalline silica possesses a heteromorphic superficial layer which reacts with serum The reaction shown by serum from silicotics or those exposed to "active" silica particles is concerned with gamma globulins, and provokes modifications in the index of refraction and in viscosity The importance of the enquiry is in laying stress on the activity of the superficial layers of silica crystals, *an activity which passes away in course of* time *E L. Collis*

WEBSTER, I **Some of the Clinical, Pathological and Experimental Problems of the Pneumoconioses.** *Proc Transvaal Mine Med. Officers' Ass* 1954, Sept -Dec., v. 34, No. 349, 33-8, 8 figs

Some account is given of the work being done at present by the Pneumoconiosis Research Unit, which is sponsored by the South African Institute for Medical Research and the Silicosis Medical Bureau. Although all forms of pneumoconiosis come within the activities of the Unit, at present it is concerned with silicosis, anthraco-silicosis and asbestosis The Unit aims at explaining the progressive nature of silicotic fibrosis Silicic acid is held to combine with tissue protein, either in the alveolar walls or in the foci *where there is destruction of* alveolar phagocytes and aggregations of silica This silicic acid-protein complex acts as an antigen in the body, producing a tissue and a circulating antibody, both of which will combine with the antigen to cause a further alteration of protein. This and other theories are under close investigation by experiments on monkeys, rabbits, guineapigs and rats These animals are being exposed

bronchitis or emphysema, is under study, *E. L. Collis*

PERNIS, B & BATTIGELLI, M. L'adsorbimento delle sieroproteine alla superficie della silice, sua possibile importanza nella genesi della silicosi **[Adsorption of Serum Proteins at the Surface of Silica: its Possible Importance in the Genesis of Silicosis]** *Med d Lavoro.* 1955, Jan., v. 46, No 1, 1-13, 3 figs [30 refs]

The English summary appended to the paper is as follows:—

"A series of ... the pathogenetic mechanism of ... proteins by sili ... taken to establ ... in solution in ... adsorbed at the surface of silica

"To this purpose it was determined, by means of photometry in the ultraviolet with the Beckmann spectrophotometer, the quantity of serum albumin and γ-globulins adsorbed by a given quantity of quartz powder or Aerosil (finely subdivided amorphous silica) Adsorption took place starting from a 0·1% solution of albumin or γ-globulins in 0 9% NaCl, at pH 7.

"It was thus observed that the quantity of γ-globulins adsorbed by a given quantity of quartz powder or Aerosil was 2–3 times greater than the quantity of serum albumin adsorbed in the same conditions It was also noted that with equal surface the quartz was capable to adsorb much more proteins than Aerosil

"Adsorption experiments were therefore carried out on whole human serum by percolating the latter through carbon, quartz and Aerosil powder columns At the electrophoretic analysis it was seen that whilst the proteic composition of the fluid flowing from the ... column corresponded to that of the non-treated

lins.

"The experiments carried out have therefore shown that human serum globulins, and particularly γ-globulins, have a high trend to be adsorbed on silica It is held probable that the adsorption on quartz is followed by a denaturation of the adsorbed proteins and that this phenomenon could have an importance in the genesis of silicosis."

SCHUMACHER, H Experimentelle Untersuchungen uber die Adsorption von Lysozym an Mineralstaub **[Experimental Investigations on the Adsorption of Lysozyme by Mineral Dusts]** *Beiträge z Silikose-Forschung.* 1953, No 23, 59–74, 2 figs [20 refs]

... the hypothesis that ... cytosed and ... that occurs in phagocytes, lymph nodes and ... secretions of the respiratory system A quartz surface might be rendered harmless by such adsorption, and tests with a variety of dusts, including silicates, carbonates, sulphides, oxides, coals and aluminium metal, were made. The following results were found. Adsorption was optimal at pH 5 to 8 and under the conditions chosen it was complete in a few minutes. It was not affected by the presence of various other materials which occur in ... white plasma or sputum Adsorption varied ... variation was ... dusts and the ... hiefly measured in this rather complicated way were differences in surface area of his dusts The paper concludes with speculations which do not seem to follow from the work described.

G. Nagelschmidt

HELFERICH, B & SCHMITZ, Erika. Über den Einfluss von Quarzstaub und von Aluminiumphosphat auf einige Fermente. **[The Effect of Quartz Dust and Aluminium Phosphate on certain Enzymes]** *Beiträge z. Silikose-Forschung* 1953, No 24, 1–20, 3 figs.

This paper describes initial results on the inhibition of enzyme reactions by quartz dusts

The main system studied was the splitting of phenylphosphate by potato phosphatase, but a few experiments were carried out with β glucosidase from sweet almonds. Six quartz fractions of different origin and different size, and Aerosil, were used for the phosphatase tests It was found that the enzyme was adsorbed on the quartz, maximum adsorption being reached in less than 2 hours under the conditions chosen The larger the specific surface of the quartz the more complete was the adsorption Adsorption was measured by reduction of activity in the supernatant fluid after centrifuging down the quartz.

Other tests showed that in the adsorbed state the ... active ... ase also showed ... unit weight or surface

Two samples of aluminium phosphate with quartz ... phosphatase and so did ... m silicate ... resh sample of ... ie work is to be

Nagelschmidt

DANIEL-MOUSSARD, H Étude *in vitro de l'actio de la silice sur l'activité de la ribonucléase* **[Study *in Vitro* of the Action of Silica on th Activity of Ribonuclease]** *C R Soc Biol* 1955 Mar, v. 149, Nos. 5/6, 505–7.

Toxic agents often act by destroying enzymes Experiments were carried out to ascertain whether silica exerted such interfering action upon the enzyme ribonuclease Recognition of the importance upon metabolism of the ribonucleic acids determined this choice The procedure is described It was performed with and without silica The conclusion drawn is that, at any rate, in these in vitro experiments, silica exerts no influence upon the activity of ribonuclease.

E. L Collis

RAY, S C, KING, E. J. & HARRISON, C V **The Action of Variable Amounts of Quartz on the Lungs of Rats. The Extent of Pathological Change in relation to the Amount Injected.** *Brit J. Indust. Med* 1951, Apr, v. 8, No 2, 62–7, 4 figs.

. . . work [referred] to in

changes in describing the results the . . . make a classification of five stages of fibrosis, as follows :—

Stage 1. Loose reticulin fibrils, no collagen
„ 2 Compact reticulin, little or no collagen
„ 3 Somewhat cellular, mostly collagenous.
„ 4 Acellular, wholly collagenous
„ 5 As 4 but also confluent

A dose of 2 mgm of quartz was eliminated completely from the lungs but showed some fibrosis in the . . . 5 and 10 mgm of quartz . . . first . . . 30 . . . seen . . . rosis after 207 days Average sizes of the largest nodules seen are given They show a fairly regular progression with time and dosage, and they range, for stages 4 and 5, from 0 5 to 1 1 mm.

The results confirm the opinion that small amounts of quartz are removed by phagocytosis to the lymph . . .

Ray, S. C, King, E J. & Harrison, C. V. **The Action of Small Amounts of Quartz and Larger Amounts of Coal and Graphite on the Lungs of Rats.** *Brit J. Indust Med* 1951, Apr., v 8, No 2, 68–73, 4 figs. [29 refs.]

. . .

cent, of ash Alone, they led only to stage 1 fibrosis . . .

reached in 63 and stage 2 in 153 days. Together with graphite the 2 mgm of quartz produced stage 1 . . .

with the previous paper, where it was shown that 2 mgm. of quartz caused no fibrosis at all in the lungs (stage O after 365 days) *G. Nagelschmidt*

Ray, S. C., King, E. J. & Harrison, C. V. **The Action of Anthracite and Bituminous Coal Dusts mixed with Quartz on the Lungs of Rats.** *Brit. J. Indust. Med.* 1951, Apr, v. 8, No 2, 74–6

Air-borne dusts from an anthracite and a bituminous coal mine were used in further experiments with rats by the intratracheal injection technique. As it was already known from previous work [Belt and King, this *Bulletin*, 1945, v. 20, 776] that † similar dusts by themselves produced only a slight foreign-body reaction (reticulinosis) the dusts were mixed with the same sample of quartz as used . . .

and mica.

. . .

It has been postulated from time to time that the inhalation of coal dust protects the lung against the fibrogenic action of quartz. The present experiments do not support this view, on the contrary they demonstrate that inert material can aggravate the action of quartz, although only to a small extent Both dusts acted in the same way and the experiments did not show the anthracite to be a greater hazard than bituminous coal. *G. Nagelschmidt*

Dale, Jean C & King, E. J. **Acute Toxicity of Mineral Dusts.** *Arch. Indust Hyg. & Occupational Med* Chicago 1953, June, v 7, No 6, 478–83 [*Refs in footnotes*]

Previous experiments have shown that intravenous injection of a solution of silicic acid produces intravascular clotting and death of . . .

A large variety of quartz suspensions and solutions, and suspensions of other minerals, were injected intravenously into mice and the lethal dose was determined Owing to the very small number of animals used (3-5 in most experiments) it was not possible to

* v. II, 455

† v. II, 181

show a significant difference between the toxicity of dusts in the particle size range 0 1–8μ, even when they were as different as quartz and anthracite.

Colloidal silica, however, in various forms, even with adsorbed dyes or protein, was about 10 times as toxic as any of the other materials tested, though only one of these, india ink, was of comparable particle size

The authors suggest that the acute toxicity of colloidal silica is due to its ability to precipitate protein. The chronic irritation produced by larger quartz particles may then be due to the polymerization of released silicic acid to colloidal dimensions. If the particles are too large, the rate of release of silicic acid is too low to be effective. There is thus an optimum particle size range for the production of silicotic nodulation

[This interesting study is marred by two defects · 1 The contrast between colloidal silica and the [illegible]

2 [illegible]

of 30 different dusts If the same number of animals had been used for a smaller number of dusts, statistically significant results might have been obtained *B M. Wright*

KING, E. J., MOHANTY, G. P , HARRISON, C V. & NAGELSCHMIDT, G. **The Action of Different Forms of Pure Silica on the Lungs of Rats.** *Brit. J. Indust Med.* 1953, Jan , v. 10, No. 1, 9–17, 13 figs

Pure silica exists in 4 modifications, all of which are soluble to about the same extent . quartz, tridymite, cristobalite and fused silica , the first 3 are crystalline, and the last is a non-crystalline solid. An enquiry is reported to ascertain if all caused similar tissue reactions. Rats were given intratracheal injections of 50 mgm. of each and the resulting lung reactions were noted. They differed greatly. The injections contained suspensions of [illegible] The histological [illegible]

duced more severe and rapid fibrosis, which was always about a month ahead of quartz in its progress. But tridymite was even more active, with a fibrosis more diffuse than nodular, probably because of the speed of its production, which reached the maximum degree as soon as the sixtieth day The tridymite effect was spectacular ; grade 2 fibrosis was reached in one month , and grade 5 in two months ; the fibrotic masses continued to grow, until in 12 months there was hardly any normal lung tissue left. The facts are clear, but why tissue reactions are thus related to the crystal structure of the dust particles remains a mystery. [No trial is reported as to whether the different reactions showed different predispositions to develop tubercular infection which is so characteristic of the pneumoconiosis caused by quartz dust.]

E. L. Collis

KING, E. J., MOHANTY, G. P., HARRISON, C. V. & NAGELSCHMIDT, G. **The Action of Flint of Variable Size Injected at Constant Weight and Constant Surface into the Lungs of Rats.** *Brit. J. Indust. Med.* 1953, Apr., v. 10, No 2, 76–92, 31 figs. [12 refs]

In order to obtain precise information of the effect of particle size and surface area on the degree of fibrosis produced by silica dust, the results of two series of experiments were compared. In both, pure flint of varying particle size from 8μ to less than 0·5μ [illegible] tion [illegible] rat [illegible] surf [illegible] 700 sq. cm. The results were assessed on the basis of maturity of the lesions, and recorded in 5 grades The minimum time taken to arrive at the different grades was also taken into account The illustrations consist of well reproduced photomicrographs of lung sections showing the histological appearances of the lesions.

In the constant-amount series there was a regular increase in activity as the particle size decreased, the differences in the results obtained from the different fractions being large. The surface area in this series varied from 170 sq cm per rat with the 4–8μ fraction to over 3,000 sq cm. with particles below 0·5μ. In the constant-surface series the most marked fibrosis was produced with the fraction of 1–2μ particle size. [illegible] each [illegible] ction [illegible] that fibrogenesis is closely related to silica surface They also suggest, however, that there is a range of maximally fibrogenic sizes which probably lies in the region of 1–2μ. Further experiments are projected.

A. T. Doig

MOHANTY, G. P , ROBERTS, D C., KING, E. J , HARRISON, C V. & NAGELSCHMIDT, G **The Effect of Felspar, Slate and Quartz on the Lungs of Rats.** *J Path & Bact.* 1953, Apr , v. 65, No 2, 501–12, 16 figs on 4 pls. [24 refs]

Experiments were conducted to compare the effects on the lungs of rats of the silicate minerals felspar and slate with that of quartz, and to see whether and in what way their admixture with quartz modifies its action The epidemiological evidence on

the subject is obscure and open to various interpretations

All the dust samples were prepared by water sedimentation, and the sizes of the particles were as follows —

Sample size in μ	Felspar	Slate A	Slate B	Quartz
	Percentage by mass			
up to 1 80	93 4	79 1	53 6	50 2
1 80–2 60	6 7	13 8	31·4	46 4
2 60–3 60		7 2	15 0	3 4

The particles were of comparable specific surface They were suspended in saline and injected intratracheally into rats, and the pathological effect on the lungs was compared up to 500 days

The results showed that both the silicate dusts were very much less fibrogenic than quartz, and that slate had slightly more effect than felspar. The slate dust contained about 15 per cent. of quartz (by X-ray diffraction) so that such effect as it had could be attributed to the presence of this mineral Previous experiments [RAY *et al*, this *Bulletin*, 1951, v. 26, 997] had shown that the same amount of quartz injected by itself produced more effect, so that it seems that the admixture of the non-quartz content of slate has a retarding effect *B M Wright*

KING, E J, MOHANTY, G P, HARRISON, C V & NAGELSCHMIDT, G **Effect of Modifications of the Surface of Quartz on its Fibrogenic Properties in**

footnotes]

† *Bulletin*, 1953, v 28, 717 *bis*] suggest that quartz

and untreated quartz, were injected intracheally and intraperitoneally into rats and mice The Ringer-extracted and coal-coated quartz produced the same reaction as the control but the quartz etched with HF produced an acute haemorrhagic and inflammatory

defective lattice structure on the surface of the quartz *B. M. Wright*

RUTTNER, J. R Befunde bei experimenteller Silikose **[Experimental Silicosis]** Reprinted from *Schweiz Ztschr f Allgemeine Path u Bakt.* 1950, v 13, No 6, 4 pp, 6 figs.

Two series of experiments are described. In the first series quartz, corundum (Al_2O_3) and a mixture of equal parts of these, were injected intravenously into rabbits and the effects in the liver were studied The particle size was under 3 μ, the dose was 80 mgm of dry substance in aqueous suspension, and the experiments extended to one year The results showed with quartz, marked increase of the connective tissue of Glisson's capsule, cirrhosis of the liver and the formation of nodules, with corundum, only a foreign-body reaction was produced, with no fibrosis, with the mixture of quartz and corundum the typical quartz reaction was not prevented and the histological appearance was like that with pure quartz

In the second series of experiments aqueous suspensions of quartz, of corundum, and of hornblende asbestos (tremolite) were introduced into the peritoneal cavity of mice, the particle size was under 2 μ and the doses were 5–7 mgm, the animals were killed at intervals up to 13 months The results showed: with quartz, in 35 days, typical nodules, at first cellular and later fibrous, on the surfaces of the organs, the nodules developed a concentric arrangement with collagen fibres, lost their cells, and became hyaline With corundum no fibrotic reaction was

substances, corundum and hornblende, the action of quartz is not merely a mechanical injury but that other factors (solubility, surface action, etc) occupy the foreground *E. L Middleton*

KOCH, W. Die Wirkung verschiedener Kieselsäure-

* p 89 † p. 316 *bis* ‡ v II, 189

The experiments were intended to throw light on the

necrotic and early fibrotic stage and the fat particles appear specially in the cells surrounding the small fibrotic nodules At the late fibrotic stage little fat is visible. Iron pigment appears at about the same time as the fat and persists in the fibrotic areas.

With colloidal silica, only the initial reactions are the same, namely the formation of a resorption granuloma followed by necrosis. The necrotic material is, however, currently removed and no fibrosis occurs, up to about 18 months. After this, cysts begin to develop which may reach several inches in diameter These cysts are not at the site of the injections. One cyst contained, on analysis, 92 per cent. protein and water, 3 5 per cent. lipoids and fats, 4 4 per cent. silica and 1·1 per cent. other ash [a total of 101]. At the same time as the cysts begin to develop the animals lose condition; they show no resistance to bacterial or fungal infections and they tend to die in a few months.

The description of the results is followed by a review of the literature of the silicotic process and a very interesting and detailed, although speculative, discussion which cannot be given in full. The chief points are that the action of quartz is a mixed one, partly due to foreign-body effect and partly to silica ... depends on

soluble silica offered ... breaks down and the cyst formation indicates a process of storage of the toxic material by encapsulation in the subcutis.

The effect of the sensitizing protein is to increase the capacity of the organism to cope with larger amounts of silicic acid and to enhance the formation of necrotic areas; it may also enhance the fibrogenic tendency. *G. Nagelschmidt*

KLO

Colloidal silica is an extremely toxic substance and its introduction into the lungs or the bloodstream of experimental animals usually leads to rapid death The author with JÖTTEN had previously found [this *Bulletin*, 1952, v 27, 940] that amorphous * silica (aerosil) had such effects and the present experiments were undertaken to see whether silica in molecular dispersion was equally toxic or whether the toxic effect was due to the larger particles of colloidal size

Silica in molecular dispersion as determined by colorimetric methods was obtained by concentrating ultrafiltrates of aerosil followed by renewed ultrafiltration In this way solutions of pH 5 to 6 containing 1 to 3 mgm of SiO_2 per ml in true solution were obtained They were unstable and had to be freshly prepared for every experiment Various amounts of these solutions were injected intratracheally into rats and the minimum lethal dose was found to be 1 8 mgm SiO_2 Polypnoea and cyanosis were observed as disease symptoms Of 9 rats which had received 1·5 mgm SiO_2 or less, 8 recovered in the course of a fortnight and survived thereafter for at least 4 months.

Sections of the animals that had received over ... showed uniformly hyperaemia of the lungs, ... cytes in the ... given in detail ... molecularly dis- ... at of colloidal ... described as a ... trombahn) with ... nd leucocytes ... ho stated that ... a toxic and a ... solubility of a ... are the toxic ... the more pro-

G. Nagelschmidt

KLOSTERKÖTTER, W. Weitere Untersuchungen über die Gewebswirkung kolloidaler und molekular geloster Kieselsaure. **[Further Investigations on the Tissue Action of Silica in Molecular and Colloidal Dispersion]** *Arch. f Hyg u. Bakt* 1953, v. 137, No. 4, 307-16, 12 figs [25 refs.]

In continuation of previous work [this *Bulletin*,

* p 79. † See above

1953, v. 28, 120] experiments are described (1) on inhalation of molecularly dispersed silica, and (2) on injection of such silica which had been rendered non-toxic by addition of organic colloid preparations

The inhalation experiments were carried out on rats by spraying with an aerosol generator filtered and centrifuged solutions of Aerosil (0·2 per cent. SiO_2). Aerosil is a form of amorphous silica The animals were killed after 150 to 300 days' inhalation A little perivascular fibrosis was found in a few cases. The author believes that molecularly dispersed silica in general is excreted but that some accumulation of condensed silica may have occurred and caused this fibrosis

Previous intratracheal and intraperitoneal injections had shown that the lethal doses were small, by adding Kollidon and Periston (Kollidon is said to be polyvinyl-pyrrolidon) much larger doses were found to be tolerated by rats and such higher doses were given repeatedly (*e g*, 800 mgm. SiO_2 per rat in 4 doses) The animals died after 3 to 7 months

concentration the amorphous silica causes accumulation of macrophages and foam cells, new formation of interstitial tissue (fibrosis) and necrosis

By these experiments the author claims to have proved that fibrosis can be caused by amorphous silica It is therefore not necessary to assume a *specific effect due to crystal structures as postulated by* Jaeger The author is, however, careful to point out

KLOSTERKÖTTER, W & JOTTEN, K W Die Wirkung verschiedener Kieselsaure-Formen im Tierexperiment **[The Action of Different Forms of Silica in Animal Experiments]** *Arch f Hyg u Bakt* 1953, v 137, No 8, 625–36, 10 figs. [35 refs]

This paper summarizes and discusses a number of intratracheal injection experiments on rats with different forms of silica and silicates These were supplemented by a few intraperitoneal-injection and dust-inhalation experiments The particle size of the dusts was in the range of 0 5–3 0 μ, the dosage was 50 mgm per rat, and over 400 animals were used

First it was shown that molecularly dispersed silica on intratracheal injection of a 0 2 per cent solution caused oedema of the lungs leading to immediate death Weaker solutions showed no permanent lung changes at all

Aerosil v 27, mgm mounts

produced necrosis, bronchitis and other cell reactions but did not produce any fibrosis The same held for larger amounts of Aerosil mixed with Periston, which seems to inhibit the toxic effects to some extent Only in intraperitoneal tests were rare slightly fibrosed nodules formed.

The following materials were all given by intratracheal injection and the classification of BELT and KING for degree of fibrosis is used by the authors: silica gel, which did not cause any fibrosis but had a toxic effect; an opal with about 30 per cent quartz gave fibrosis grade 1 after 4 months and grade 2 after 12 months; a flint with 70 per cent quartz *gave grade 3 after 12 months Quartz was given at* 4 different levels from 20 to 75 mgm per rat The results were similar to those described by KING *et al* [this *Bulletin*, 1951, v 26, 997] fibrosis up to grade 5 † being seen, the higher the doses the quicker was the fibrosis

The authors point out that in the presence of inflammatory processes, pneumonia, lung abscesses, there is distinctly less fibrotic tissue formed

Two silicates were also tested Potash feldspar gave grade 1 after 15 months and hornblende proved to be completely inert

The results are summarized in a table and the following conclusions are drawn

1 It is likely that the toxic effects seen with molecularly dispersed silica are a result of colloidal silica which originates through polymerization at high concentrations

2 Colloidal silica is very toxic and may under suitable conditions produce slight fibrosis

3 The silica solubility theory cannot be stated as the higher the solubility the greater the fibrosis It is possible that a slow supply of colloidal silica of a particular kind is required

4 Crystal structure considerations may be valid but so far no acceptable theory of the origin of the silicotic nodule can be given *G Nagelschmidt*

SCHEEL, L D, FLEISHER, E & KLEMPERER, F. W. **Toxicity of Silica. I. Silica Solutions.** *Arch Indust Hyg. & Occupational Med.* Chicago. 1953, *Dec*, v 8, *No* 6, 564–73, 1 *chart.* [*Refs* in footnotes]

The mechanisms by which silica exerts its toxic influence upon the tissues is investigated All known *toxic agents react with or alter* some normal constituent of the body in which the toxic action is elicited The interaction of protein solutions, which are essential to and characteristic of normal living tissues, with silicic acid solutions was studied A silicic acid solution containing less than 160 mgm. of SiO_2 per litre was found not to form a colloidal solution when neutralized, and no interpretation of silicic acid with proteins took place in solution. Indeed, protein solutions delayed the formation of a gel phase by silicic acid The experiments are described upon which these conclusions are based

* p 79.

† p. 88

The presence of salts in the solution increased the rate of solution of quartz; but in no case did the concentration approach the gel point of 160 mgm. per litre. The rate of solution of quartz in albumin was even slower than in water; and dilute solutions of silicic acid lowered the solution of quartz The quartz adsorbed albumin on its surface. A relatively soluble form of particulate silica when injected into rats dissolved appreciably in the body fluids and was readily excreted *via* the kidneys, here, the silica content of the urine might exceed the value of 160 mgm. per litre, the gel point in water, without forming a colloidal suspension. Intraperitoneal injection of 500 [illegible]

tissue fluids

The rapid excretion of silica in the urine after intraperitoneal injection of particulate silica gel (exhibited in a chart) demonstrates that silica in solution in body fluids does not reach a toxic concentration and is readily excreted by the kidney. But colloidal silica gel is toxic, and, if formed in the body, would so react. The excreted silica was non-colloidal, an alkaline silicate; the *p*H of the urine [illegible]

SCHEEL, L D, SMITH, B, VAN RIPER, J & FLEISHER, E **Toxicity of Silica. II. Characteristics of Protein Films adsorbed by Quartz.** *Arch Indust. Hyg & Occupational Med* Chicago 1954, Jan, v. 9, No 1, 29–36, 2 charts

Earlier observation [this *Bulletin*, 1954, v 29, *383] had shown that quartz particles 1 to 3 microns in diameter adsorbed protein from solution, and it was decided to make a further study of this.

Quartz particles 1 to 3 microns in diameter were prepared. Crystalline egg albumin, bovine albumin, fibrinogen, were chosen as the proteins for study because they were commercially available in a state of reproducible purity. The adsorption of albumin is maximum on the acid side of the isoelectric point, [illegible] amount of protein adsorbed decreases rapidly

tion became complete in about 4 hours [illegible] that the dust was resuspended in a solution of different protein at the same concentration no further adsorption took place, but if it was placed in a solution of a different protein at a higher concentration more protein was adsorbed Thus the protein concentration determined the amount of protein adsorbed for any given *p*H value

* See above.

The lack of specificity of the protein film on the quartz surface was shown both by the combination of the adsorbed film with specific antibodies, and by the ability of the film to produce heterogeneous antibodies when injected into a rabbit. Adsorption of rabbit serum by quartz altered the nature of the serum protein in the film in some unknown manner, which resulted in a clearly demonstrable agglutination reaction The agglutination titre in the rabbits in response to the injection of particulate material of comparable particle size has not been obtained with materials other than quartz which have so far been tested, *viz.*, alpha aluminium hydroxide, silica gel, olivine, quartz treated with aluminium hydroxide, beryllium oxide, and opal.

The alteration of protein structure in the adsorbed film is shown and it is considered possible that the toxic action of the quartz particle may be the result of a foreign protein reaction in the tissues.

Thomas Bedford

HOLT, P F. & BOWCOTT, J. E. L **Adsorption of Protein on Silica Surfaces.** *Arch. Indust Hyg. & Occupational Med* Chicago 1954, June, v 9, No 6, 503–6, 2 charts

A study was made of the adsorption on to silica dust of serum albumin, the protein most abundant in the body plasma Albumin is a surface-active substance, and when a drop of its solution is placed on to a water surface it spreads to form a monolayer The area to which it spreads is a measure of the mass of albumin present This technique was used to determine the albumin concentration in solutions To obtain a large adsorbent area, fine dust of silica was used The adsorption of protein on to a silica surface varied with the *p*H of the solution, being maximal between *p*H 5 and 6 The *p*H of the tissues is 7 4. The concentration of albumin in serum normally lies between 4 5 and 7 mgm. per 100 ml. [*sic*; the normal serum albumin figure usually given is 3 5 to 5 6 gm, not mgm.]. The amount of protein adsorbed was found to be too small to affect appreciably the rate of the solution of the quartz

The conclusion drawn is that a quartz surface is not sufficiently altered by adsorbed albumin to affect appreciably either the rate of solution of the quartz in serum or the type of surface presented to phagocytes Further, the adsorption of proteins from the tissue fluids on to dust surfaces is unlikely to have any importance in the silicosis problem

E. L. Collis

DERNEHL, C. U., NAU, C. A, FRANK, T M. & NEID- [illegible]

Cavies were exposed daily in a chamber to a dust cloud of an industrial catalyst, chemical analysis of which showed loss on ignition 21 8 per cent, SiO_2

64 5 per cent, and Al_2O_3, 13 6 per cent Of the particles in the chamber 58 per cent. were 2 μ or less, and 3 per cent over 10μ. Exposures for 44 hours a week to 800 million particles per cubic foot of air proved lethal within a few weeks, and the experimental level was reduced to 450-500 million particles per cubic foot With this exposure, 31 of 41 animals died during the period of 64 weeks while only 8 of the 23 control animals died. Deaths in each group were mainly due to pneumonia.

Figures are given of the total silica content of the lungs of 23 of the experimental animals, and show a considerable variation, from 0 089 mgm /gm to 3 89 mgm /gm

Histological sections of the lungs stained by silver impregnation showed a tendency for an increase in reticulin fibrils in the alveolar walls with increase in

type of chronic pneumonia characterized by large

monia in the exposed animals as resulting from a lessened resistance to infection Since the dust contained amorphous aluminium hydroxide as well as amorphous silica gel, they are unable to determine whether pure silica gel would produce similar effects.

H E Harding

GÄRTNER, H. Untersuchungen uber die Wirkung feinkorniger, amorpher Kieselsaure in der Lunge von Kaninchen **[On the Effect of Amorphous Silica of Small Particle Size on the Lungs of Rabbits]** *Arch f Hyg u Bakt.* 1952, v. 136, No. 6, 451–67, 11 figs. [17 refs]

Rabbits were exposed to dust inhalation of amorphous silica of high purity (aerosil) The primary particle size was of the order of 100 to 500 Å, but the material was highly aggregated Exposures ranged up to 3 years and certain animals were kept dust-free for periods of 1–5 months after having been dusted for 2 years

Histological examination of the lungs showed the main reaction to be a desquamative catarrh, followed after long exposures in some cases by macrophage granuloma These reactions predisposed the animals to secondary infections and there was a high death rate of 62 per cent Increased fibrosis, or anything

Saranac Laboratory (MS report for 1950) are quoted In view of the tendency for secondary infections to

LUNDGREN, K D. & SWENSSON, A **Experimental Investigations on the Significance of the Size of the Particles in the Reaction of the Peritoneum to Amorphous Silica.** *Acta Med Scandinavica* 1953, Apr 15, v 145, No 2, 84–90, 33 figs on 19 pls

The authors investigated the effect of particle size on tissue reaction to amorphous silica, using single intraperitoneal injections in guineapigs All the animals maintained good health during the observation period, which extended from 1 to 7 months Five

reaction due to the coarse-grained ground silica to that due to the smallest amorphous particles Macroscopically the lesions diminished in size and altered in appearance, and in the case of the very small particles the proliferations became less marked after 2½ and 7 months than after one month. Microscopically there were also marked differences, from the typical quartz reaction produced by the crystalline silica, which appeared in all animals, to tiny proliferated areas on the parietal peritoneum appearing only in some animals with the smallest particles Sometimes the omentum was found to be adherent to the peritoneum With the middle grades of amorphous powder there were two types of reaction; one,

fact that they tend to become less marked after long periods suggest that one or other of these possibilities is happening Their experiments are continuing

A. T Doig

POLICARD, A. & COLLET, A. **Toxic and Fibrosing Action of Submicroscopic Particles of Amorphous Silica.** *Arch Indust Hyg & Occupational Med* Chicago 1954, May, v 9, No 5, 389–95, 6 figs [13 refs]

inhibitory influence, but cannot be expected to exert any lasting effect on pneumoconioses. The hormonal constitution of miners might be investigated.

E. L Collis

LANCET. 1953, Apr 4, 694–5 **Effects of Hormones on Silicotic Nodules.**

This anonymous article gives an excellent review of *recent experimental work with cortisone and* ACTH Treatment with these substances immediately or shortly after peritoneal or intratracheal injection of silica seemed to inhibit the formation of fibrous tissue when fibrous tissue was already present no significant effect was seen. A trial in a case of acute human silicosis resulted in improvement in symptoms and in respiratory function It was thought possible that in this case the lesions may have contained many cellular elements which had not been converted into fibrous tissue

retarded in groups of mice receiving, separately, diethyl stilboestrol dipropionate, insulin, and thyroxine In cortisone-treated rabbits, in addition to the expected results of inhibition in the formation of reticulin and collagen, an unexpected change was observed after 30 days The abdomen was filled with pink gelatinous polypi, consisting mainly of thin-walled blood vessels in a structureless ground substance and later replaced by widespread disorderly fibrous tissue It is not known whether this is really a cortisone effect

A T Doig

STACY, B. D & KING, E. J **Silica and Collagen in the Lungs of Silicotic Rats treated with Cortisone.** *Brit J. Indust Med* 1954, July, v 11, No 3, 192–7, 5 figs [22 refs]

It is recognized that cortisone inhibits proliferating connective tissue and the mobility of dust-laden phagocytes Its action on the developing silicotic nodule is here reported Rats were injected intratracheally with 50 mgm. of quartz dust, whereupon over the first 200 days an almost linear increase with time occurred in the amount of silica in the lymph nodes, while at the end of the first month about 50 per cent of the silica injected was found in the respiratory system Rats of one group were given cortisone; the rest served as controls

The lungs and lymph glands were analysed for silica and collagen. The methods followed in these analyses are explained While silicosis was developing a relatively small amount of silica was found in the cortisone lymph nodes, and the cortisone lungs contained more than the controls; this indicates that the hormone interfered with the mechanism normally responsible for transferring the dust to the nodes.

the formation of collagen in the lungs was inhibited. Collagen is a product of the metabolic activity of fibroblasts, and the lower values found in the treated group support the view that cortisone modifies fibroblast activity

E L Collis

MARENGHI, B & ROTA, Lorenza Effetti del cortisone sulla silicosi sperimentale del ratto. **[The Action of Cortisone in Experimental Silicosis in Rats]** *Med d. Lavoro* 1953, Aug–Sept., v. 44, Nos 8/9, 383–97, 15 figs [23 *refs*]

"Twenty rats were exposed 7 hours a day for a period from one to six months to an atmosphere containing about 14,000 particles of pure quartz per ml Ten of these rats were injected thrice a week with mg 2 of Cortisone and ten kept for control Some animals died spontaneously of different causes, some were killed Eight animals, of which four [were] control and four treated, survived over 300 days, having breathed in the dust atmosphere the total amount of 816 hours

"The first reaction of the lung tissue to inhaled quartz was the appearance of intralveolar *dust-cells* containing phagocytosed quartz Later on round masses of dust cells appeared in the connective periarteriolar and peribronchiolar tissue

"Carrying on with the experiments, the number and size of adventitial cellular aggregates increased gradually. reticulin fibrils appeared first loose and then more compact; later on, after 200 days, some collagenous fibres were to be seen. No histological difference in the two groups of animals was noted until 270 days, after which the collagenous fibres increased considerably in the control rats, and in the nodules hyaline degeneration was to be found

"The mature nodules became rapidly larger and confluent in great hyaline masses, deforming the lung structure to such an extent as to render the organ difficult to be recognized

"Instead in the Cortisone treated rats nodules kept small and were mostly composed of macrophages; reticulin fibrils were still numerous, the collagenous fibres very scanty, *presenting a minor* hyaline degeneration Only in the advanced stages a *fibrosis* with big strands appeared, under the appearance of linear fibrosis, not deforming the lung structure

"Therefore we may say that the amount of mg 2 of Cortisone thrice weekly, had very little influence on the initial cellular reaction to silica; whereas Cortisone, delaying or preventing the transformation of reticulin fibrils in collagenous fibres, precluded the progressive increase of the nodules and above all, their confluence in fibrotic masses"

MARENGHI, B. & ROTA, Lorenza **Effect of Cortisone on Experimental Silicosis in Rats.** *Arch. Indust. Hyg & Occupational Med* Chicago 1954, Apr, v. 9, No. 4, 315-22, 8 figs

The effect of cortisone on silicosis was studied by making rats inhale silica dust Twenty were placed in a cabinet into which a dust cloud of silica particles was introduced, while a treadmill compelled the rats to keep moving and so keep their pulmonary ventilation active Half the rats received subcutaneous injections of 2 mgm cortisone acetate thrice a week. The dust exposure was continued up to 6 months The dust concentrations were in the range of 14,000 particles per cc. The lungs of the two sets of rats showed no differences in reactions to the dust up to 270 days Thereafter, the control group showed rapid advance in hyaline degeneration of collagenous fibres with fibrosis involving the whole lung, while respiratory function remained only in small areas dispersed among fibrotic masses Often it was difficult to recognize the tissue as lung On the contrary, the cortisone-treated rats showed numerous reticulin fibres with scanty collagenous fibres and minor hyaline degeneration The cortisone arrested the transformation of reticulin to collagenous fibres, it had a direct effect in delaying the development of fibrosis and fibrotic masses.

E L Collis

RAULE, A, PECCHIAI, L & GRISLER, R. Azione del testosterone in cavie sperimentalmente infettate con bacillo di Koch, con riferimento alla terapia della silico-tubercolosi. **[Action of Testosterone in Guineapigs experimentally infected with *Myco tuberculosis*: its Relation to the Treatment of Silicosis with Tuberculosis]** *Med d Lavoro.* 1953, Nov, v 44, No 11, 475-84, 5 figs [19 refs] English summary

The authors have already published an account of favourable results which they have obtained from shock doses of testosterone given to patients suffering from silicosis with tuberculosis [see this *Bulletin*, 1952, v 27, 671] They have now followed this experience by experimenting on guineapigs They have used 20 animals, weighing about 250 gm each, and injected them subcutaneously, above the inguinal ligament, with 1 cc of an aqueous suspension (1 mgm of culture) of *Myco tuberculosis* The experimental infection was deliberately of medium virulence to avoid violent reactions Ten of the animals were also injected with 0 5 mgm. each of testosterone propionate [The summary mentions "daily" injections, but this is not clear from the text which refers to "shock" and to "massive" doses.] The other 10 guineapigs were studied as controls.

Four guineapigs died within a few days without showing any specific lesions at post-mortem examination Two other animals which had received testosterone died on the 17th and 26th day respectively, while 2 controls died at 30 and 105 days. Of the others, an animal treated with testosterone and a control were killed at 32, 63, 103 and 108 days respectively The authors give a pathological report on each of these 12 animals.

Compared with the controls, the guineapigs which received testosterone showed less reaction in the lymphatic glands and less formation of granulomatous tissue, the sclerotic process which followed the formation of granulomatous tissue was also less hyperplastic

The authors suggest that testosterone strengthens the organism's defences by better protein anabolism and by controlling the production of corticotrophin which tends to become excessive in the presence of infection

The bacterial suspension used is said to have been made by mixing 32 mgm. of the culture with 32 cc of physiological saline and controlling its homogeneity by means of stained films

J. Cauchi

*p. 162

MOTTURA, G Strutture bronco-alveolari e topografia delle lesioni pneumoconiotiche **[The Topography of Pneumoconiosis Changes in the Broncho-Alveolar Structures]** *Med. d. Lavoro,* 1951, Mar, v. 42, No. 3, 81-96, 7 figs. [20 refs.] English summary.

Mottura has studied faithful models, reproduced by an expert in plastic material, of lung lobules which had been found to show the pathological changes of pneumoconiosis The terminal subdivisions of the bronchial tree include both (a) alveoli which open directly into bronchioles (respiratory or alveolar bronchioles) and, beyond these, (b) branches made entirely of alveoli (alveolar ducts or canals). Inert dusts, which have no sclerosing action, are found deposited in the connective tissue which surrounds the bronchioles and in the adventitia of the arteries (pulmonary artery system) which run in relation to the bronchioles and go on subdividing to feed the terminal branches of the pulmonary vein system over the periphery of each lobule Neither simple siderosis nor anthracosis lead to any deformities in the "bronchiolar architecture".

In silicosis, on the other hand, sclerosis occurs (a) in the "axial" connective tissue of acini and lobules, where it forms nodules, (b) in the "perilobular" connective tissue where it forms layers of sclerosis in the septa which separate the alveoli, and (c) in the adventitia of the blood vessels which run between the axial and the peripheral parts [illegible] lobule, giving

rise to sclerotic strands of a radiating pattern. This last change is attributed to an obstruction of the lymph flow along its normal axial channels and to the subsequent deviation of this lymph flow to the periphery of the lobule. Silica dust, when not quickly carried away by the lymphatic flow, settles in the connective tissue where the lymphatic channels start (rather than in the lymphatic channels themselves). The sclerosing reaction which results adds progressively to the obstruction and spreads the process to the collateral system. The interstitial lymph flow is determined by the anatomical structure and the silica either (a) collects in an axial part of the lobule where it forms a silicotic nodule or (b) settles out in layers to form a "laminar" sclerosis in the connective tissue of the alveolar septa.

J. Cauchi

MULLER, M. & MULLER, P. Une technique d'autopsie en matière de silicose. **[A Method of Examining Silicotic Material Post Mortem]** *Arch. Malad. Professionnelles* Paris. 1952, v. 13, No. 6, 594-7, 1 fig

This communication is mainly of interest to pathologists entrusted with the duty of pronouncing upon the findings at autopsy of cases suspected to be silicosis. Such examinations should always be carried out with scrupulous care and thoroughness. The method of examination is described throughout There is nothing new that any expert pathologist would not normally carry out Compensation claims must be influenced by his findings and he must be prepared for them to be subjected to legal re-examinations. Only by amassing a series of such careful examinations can light be thrown upon obscurities which must arise from time to time in deciding upon a difficult diagnosis Radiographs taken during life should be at hand for comparing with the actual

CEELEN, W. Zum Staublungenproblem (zugleich ein Bericht über eine Dachschieferlunge). **[The Problem of Pneumoconiosis (Including a Report on the Lung of a Slate Worker)]** *Beiträge z. Silikose-Forschung.* 1951, No. 13, 3-15, 1 fig

The paper gives a stimulating but somewhat speculative discussion of the silicotic process as seen by a pathologist, followed by the description of the appearance of a slate-miner's lung.

Ceelen maintains that it can be demonstrated by tissue culture that quartz particles have a damaging effect on phagocytes, which coal particles have not. [This is in contradiction to recent work by BUCKUP, this *Bulletin*, 1950, v. 25, 1146.] In producing silicosis, quartz acts first as a physical poison by adsorption, and later as a chemical poison by solution. The typical reaction in silicosis is the hyalinization of the nodules This is due to a precipitation of protein, possibly according to some antigen-antibody mechanism, where the antigen comes from the degenerating tissue and the antibody from the reticulo-endothelial system. The hyaline protein may originally come from dust cells, lymph fluid or blood plasma. This leads to a picture of the silicotic nodule where there is a structureless centre with little or no dust, whereas, at the periphery, dust gives off colloidal silica and continues to react with dust cells, and thus gradually

protein is the deciding factor, as best seen in the lymph nodes. To what extent true protein-silica compounds are involved, or whether these exist at all, is not yet known.

Mixed dusts act mainly according to the amount of quartz they contain, although there may be unknown interactions of different minerals. Reference is made to the views of LANDWEHR on the inhibiting effect of chalk.

especially an enlargement and solidification of the hilar and peribronchial lymph nodes which had led to a constriction of the main artery. The right heart was enlarged and death was due to heart failure.

The tissue appearance is described in detail There was much micro-nodulation in the lung and a great preponderance of needle-shaped particles, probably sericite, most of it in acellular dust deposits enmeshed by a thin collagenous framework. The lymph nodes were completely hyaline and there was a tumour-like enlargement of the hilar nodes.

Microscopic examination of slate drilling dust showed about 30 per cent. quartz and 9 per cent chalk, the balance being sericite and clay. The lung dust showed less chalk, some coal and perhaps slightly less quartz in proportion to sericite and clay than was seen in the drilling dust.

The major involvement of the lymph nodes may have been due to character of the dust, previous infections or constitutional factors.

G. Nagelschmidt

HÜB

After enumerating various published theories about

protein in the hyaline material, to search for mucopolysaccharides, to compare the hyaluronidase content of silicotic and normal lung tissue and to study the effect of colloidal silica on hyaluronidase and other enzymes

Kinetin of Messrs Schering A G, testicle mash and other tissue preparations were used as sources of hyaluronidase and juvenile rib mucilage as standard material for mucoprotein.

The rather complicated experimental arrangements, which are essentially based on methylene blue uptake, are described It was found that the isoelectric point of the nodule protein occurred at pH values of the order of 4 to 6·5, similar to blood protein and quite different from the pH values 1 1 to 1 8 found for muco-

effect of hyaluronidase on mucilage in proportion to the silica concentration, to retard similarly coagulation of blood serum by calcium chloride and sugar production from starch by diastase, but to have no

CURRAN, R C **Observations on the Formation of Collagen in Quartz Lesions.** *J Path & Bact* 1953, July, v 66, No 1, 271–82, 10 figs on 4 pls [38 refs]

Quartz dust injected into the peritoneal cavity adheres at once to the visceral peritoneum, mainly to the omentum Small dust masses, immediately after injection, exhibit metachromatic staining by thionin or toluidine blue, which persists until fibrous replacement of the dust masses occurs To investigate this metachromatic reaction and to observe the effect of cortisone, mice were given cortisone acetate, 1 mgm daily for 4 days and then 0 5 mgm for 42 days; subsequently they also received intraperitoneally fine quartz powder Guineapigs also received quartz dust intraperitoneally Testicular hyaluronidase was used to investigate the material deposited on the quartz foci

Directly after injection an acute cellular exudate

particles immediately after injection, and round un-

phagocyte ... the dust mas... nent occurs ... olly intracellu... ults, often in ... nals unphagocyted dust persisted for at least 22 days; the dust foci in the tissues were small, dry and crumbling for weeks, and the initial acute inflammatory peritoneal exudate was much less, but no completely inhibitory effect was exerted

E. L Collis

PERNIS, B & PECCHIAI, L La composizione amino-

No. 4, 205–13, 1 fig [22 refs]

The English summary appended to the paper is as follows —

paper chromatography (Pernis and Wunderly's method) has been used The analytical data which

be taken, in so far as the aminoacid composition goes, as a mixture built up with 4/10 collagen plus 3/10 plasma alpha globulin plus 3/10 plasma beta globulin It appears therefore that the processes which lead to hyalinosis of silicotic nodules do not correspond to degenerative processes of collagenous fibres but are rather dependent on the precipitation between the links of the primitive collagenous-reticular net of lypoglobulins, as alpha and beta plasma globulins "

PECCHIAI, L Disintegrazione e rimaneggiamento dei conglomerati nodulari sclero-ialini nella silicosi. **[Disintegration and Transformation of Sclero-Hyaline Nodular Conglomerates in Silicosis]** *Med d Lavoro* 1953, Nov., v 44, No 11, 453–68, 15 figs [12 refs] English summary.

[This abstract is taken from the author's own summary.]

Having investigated the pulmonary nodules of silicosis by histological examination the author concludes that disintegration originates in the hyaline

substance, and absorbs and homogenizes the recticular *stroma of the hyaline centre of the nodule itself.* The

is in the ... and reduction ... ue to the prese ... g the plasma p ... spro- teinaemia due to altered plasma-protein synthesis.

Charles Wilcocks

HOFFMANN, A. Ein Beitrag zur Frage des Fettgehaltes silikotischer Schwielen **[Observations on the Fat Content of Silicotic Tissue]** *Arch f Gewerbepath. u. Gewerbehyg.* 1955, v. 14, No 1, 29–36, *5 figs.* [*14 refs*]

The part played by the lungs in the assimilation of fat is discussed in the light of experiments carried out by many observers, and the work of some of these is referred to A series of researches by HOLZAPFEL *et al.* [this *Bulletin*, 1953, v 28, 120] have shown that the formation of organic compounds of silicic acid are concerned in its injurious action in silicosis, and that fat components play an important part

Research was undertaken, by histological methods, into the fat content of silicotic tissue. The method is described. Portions of the lungs of a coal miner with silicosis of medium severity were fixed in 10 per cent. formalin and sections were cut with the *freezing microtome and stained for fat, especially by* the colloidal Sudan stain of ROMEIS, which shows ... as well as the fine

were seen between the coal-containing ... droplets were also seen in the vessels. Diffuse fat staining was most marked near dust deposits where stained strands of fibrotic tissue were seen which seemed to be thicker and more swollen than the unstained fibres *The walls of arteries were changed,* the elastica being thickened and saturated with fat.

Quartz dust in the lung comes into close contact with the fats present, and adsorption has been observed by Holzapfel *et al* This might be regarded as a protective *measure to arrest the surface* action of the particles and increase their mobility. The aggregation of fat-containing phagocytes near dust granulomata suggests that assimilation of fat in the tissues is increased in those positions This is probably a general *protective measure of the* lung, the fat components aiding the movement and clearance of

dust particles through the alveolar and vessel walls. The further fate of the dust particles was not followed up, but *references are made to* experiments by other observers on the subject

E L. Middleton

BEINTKER, E & MELDAU, R. Morphologische Grundzüge besonders des Quarzabbaus silikotischer Lungen. **[Morphology of Silicotic Lungs with special reference to the Dissolution of Quartz]** *Beiträge z. Silikose-Forschung.* 1950, No 9, 29–60, 35 figs.

Continuing their work on electron *microscopic*

tions of the pictures shown, and many of them are ... droplets of ... ch

KONIG, H. Elektronenmikroskopische Untersuchungen an silikotischen Lungen. **[Investigation of Silicotic Lungs with the Electron Microscope]** *Staub.* Dusseldorf. 1952, Mar. 15, No 28, 31–8, 10 figs. on 4 pls

The lower limit of visibility, which is of the order of 0 3 micron for the light microscope, can be extended to particles nearly 100 times smaller by the use of the electron microscope. It is not sufficient,

tests such as the removal of quartz by hydrofluoric acid to check the identifications.

Lung tissue with silicotic nodules was digested *first with concentrated sulphuric acid* and potassium nitrate, followed by repeated washing in water. The remaining particles were partly transparent to 100 KV electrons. They showed many platelets which exhibited signs of chemical attack and only *gave the diffraction pattern of* amorphous silica. They could be dissolved in dilute hydrofluoric acid. Similar lung tissue treated with hydrogen peroxide showed the particles to be less attacked and to give the electron diffraction pattern of montmorillonite. The *same result* was obtained after washing the lung tissue below 300°C. and by digestion with potassium chlorate Whether the montmorillonite was *formed* in the lung by weathering of mica or whether it already occurred in the air-borne dust remains to be studied That the same lung residue shows quartz ... under

SCHLIPKÖTER, H. W Elektronenoptische Untersuchungen von Gewebeschnitten aus silikotischen Granulomen. **[Electron-Microscopical Investigations of Tissue Sections of Silicotic Granulomata]** *Klin Woch* 1955, Jan. 15, v. 33, Nos 3/4, 54-6, 6 figs

The mechanism of the origin of the silicotic nodule is still unknown. It is believed to be connected with changes in the dust cells after ingestion of quartz and as the detail is probably beyond the resolving power of the light microscope it was studied with the electron microscope

The work is based on the study of many ultra-fine sections from silicotic lesions produced by intratracheal injection of quartz into rats' lungs, with observations extending from one hour to one year after injection and with comparisons on silicotic lungs from human beings

A few days or weeks after injection, amorphous silica in the form of droplets or aggregates of small dense particles of size 0 05–0 2 μ was seen to be formed. No other change of the quartz particles was visible, in particular no fibres due to association with denatured protein were observed at the quartz surfaces

Inactivation of cytoplasm particles may lead to lack of function of the cells, which would need further biochemical study

There are 6 illustrations *G Nagelschmidt*

This is a detailed report of pathological observations in silicosis based on nearly 9,000 necropsies, chiefly

After a short historical introduction comes the statement that carbon does not, in the author's opinion, cause any fibrotic lung change although it may accumulate in the lung. Silicosis is due to quartz and the only other genuine pneumoconioses, *i e*, lung diseases due to dust inhalation, are asbestosis and aluminosis

Whether dust phagocytosed in the alveoli can be transferred into the lung tissue or not cannot be decided by a study of tissue sections. GARDNER and SIMSON and STRACHAN thought that it can be transferred and the idea is extended by the conception of GARDNER and POLICARD *that the dust (quartz) particles* cause degeneration of the phagocytes, and that a given particle may successively pass through a number of dust cells. The German school, in contrast to

He then describes the development of primary nodules which are characterized by a hyaline centre

sometimes in one-half of the lung only, are seen occasionally and are usually due to pleuritic adhesions which interfere with lymphatic drainage. Chemical analyses of lung tissue are briefly discussed.

After the general description of the silicotic process, characteristics of different types of dust are discussed. High proportions of quartz cause sharply defined discrete hyaline nodules with narrow rims of interstitial

tissue and less tendency to coalescence. The lower the proportions of quartz the wider are the rims of the nodules and there is more tendency for confluent masses to form.

The next chapter is devoted to shrinkage and softening followed by cavitation. Softening may occur in the absence of tuberculosis especially with dusts low in quartz.

The author does not believe that dust exposure ... lead to a chron...

Symptoms due to silicosis are found only in the respiratory and circulatory systems, and death may be caused suddenly by failure of the right heart. Pneu-

...

is briefly discussed and the author has no first ... of acute silicosis He does not believe

...

least hyaline areas are found. This is not always the case. As stated above silicoses occur which show only very few, if any, of these typically hyaline nodules,

...

strong argument in favour of the ... tuber- ... gainst ... acter- ... alone ... to be ... is and ... differ- ... ail. ... is, due

...

BOUNHOURE, R L & BIMES, C Recherches histo- ...

349–62, 11 figs.

This discussion is based upon careful microscopic examination of material from a case of pulmonary silicosis Particular attention is directed to the formation of the silicotic nodule First, a description is given of the blood and lymph supply of the pulmonary glands and tissues, the arterial distribution being of special importance Excellent illustrations are used to explain the arguments The ordinary distribution of dust particles in the lungs is shown by the tattooing due to soot particles ; silica particles *follow the same course, and so do other dusts* But in the case of silicosis there appear almost suddenly *microscopic mummified nodules of* a definite ... associated with areas served ... d to ... an ... ring ... rby micro-nodules, increase in size Each time there is a deposit of haemosiderin in the nodule which thereby becomes radio-opaque

The obliteration of numerous arterioles *leads to* vascular obstruction with high pressure in the *pulmonary circulation and stress thrown upon* the ...

prone to succumb to superadded infections, such as tuberculosis, but the authors hold that tuberculous infection takes no primary part in nodular formation. ... of ... ion ... as ... of ...

FRUHLING, L. & JOBARD, P. Le diagnostic anatomo-pathologique rétrospectif de la *silicose* pulmonaire [**Retrospective Diagnosis of Pulmonary Silicosis after Death**] *Arch Malad Profession-nelles* Paris. 1951, v. 12, No 5, 534–40, 6 figs

The claim is advanced that evidence in favour of a diagnosis of silicosis may be obtained to support a compensation claim by post-mortem examination Three cases are reported in which the examinations took place 2 months, 2 months and 10 days, and 5 months after death Most attention was paid to the lungs where the elastic tissue showed resistance

recognized since they had not undergone decomposition Tuberculous lesions with specific necrosis

PFEFFERKORN, C. ... hungen ... lungen ... itent of ... 1951,

fractions above 1 micron, using liquids of densities

These are said to be probably formed in the lungs as alteration products of silicate weathering They carry surface layers which melt into droplets under the electron microscope. Such droplets had previously been interpreted [this *Bulletin*, 1950, v 25, 381] as amorphous silica As these droplets are not observed after very thorough degreasing of the lung residue they are believed to be organic layers of fat or lipoids or perhaps of organic silicon compounds

G. Nagelschmidt

* v II, 364

PRATT, P. C. **The Determination of the Total Weight of Silica, and its Correlation with Tissue Reaction, in the Lungs of Experimental Animals.** *Amer. J. Path.* 1954, Sept.-Oct., v. 30, No 5, 1003-11, 1 text fig & 4 figs on pl

"A method is described by which the weight of silica, or other components, in pulmonary tissue can be calculated and correlated with microscopic pathology

"An animal experiment is reported to demonstrate the correlation between silica content and tissue reaction The correlation between total silica content on a weight basis and tissue reaction is shown to be far better than the correlation between silica content

RUT

The deceased man had been a stonemason for 51 years, employed for many years on stone with

bases, and marked calcareous deposits at both hila

very fully reported The special interest in this case

DÉROBERT, L., CECCALDI, P. F., RIMSEY, A. & OBERLIN, A. Apport des méthodes cristallographiques dans l'étude des poumons de silicose **[The Use of Crystallographic Methods in the Study of Silicotic Lungs]** *Arch Malad. Professionnelles* Paris 1955, v. 16, No. 2, 101–7, 4 figs.

The case is described of a man who died of silicosis after only one year's work as sandblaster. Chemical analysis of the lung gave 55 mgm SiO_2 in 100 gm fresh lung. This is said to be a very low value. The ash of a silicotic nodule was therefore analysed by X-ray diffraction and an excellent quartz pattern was obtained. Electron microscopy of a fine fraction of the ash showed particles of average size 1 μ.

Platy and dense particles found are said to be quartz and mica, and the presence of quartz was confirmed by electron diffraction techniques.

G. Nagelschmidt

VAN MARWYCK, C & FISCHER, Elisabeth Über die Beeinflussbarkeit der Quarzstaubphagozytose durch Leitstaube. **[The Effect of Protective Dusts on the Phagocytosis of Quartz]** *Arch. f Hyg u. Bakt* 1951, v 135, No 3, 161–74, 14 figs. [36 refs.]

The paper describes tissue culture experiments with macrophages obtained from chick embryo spleen cultures. The technique used is given in detail. The dusts, mostly below 3 microns in size, were mixed as suspensions in Ringer solution (30 to 40 mgm per 15 ml.) with the plasma fluid before the tissue was added at the first transfer. Observations were made by phase contrast microscopy. It was found possible to recognize and count the dust particles within the cells but it was not possible to distinguish one dust from another. Calcium carbonate, gypsum (Sucal), two sources of aluminium metal and kaolin (bolus alba) were studied as protective dusts alone and in mixture with quartz. There was evidence from animal experiments carried out in Jötten's Laboratory (Münster) that these dusts retarded or inhibited nodular fibrosis due to quartz inhalation. A series with quartz alone was also run.

All measurements were made at various interval between 13 and 44 hours after the mixtures had been set up. The proportions of empty to dust-laden cells and the number of free dust particles were counted for given areas as well as the numbers of dust particles in 100 dust-laden cells. Previous investigators in this field had always counted the number of phagocytes as a proportion of the number of macrophages. This is considered to be useless as it leads to inconclusive results. In the present work the number of dust particles in 100 dust-laden cells was determined instead.

The results are presented in detail. They can be summarized by saying that kaolin, gypsum and black aluminium metal increased the phagocytosis of quartz by 20, 40 and 60 per cent. Calcium carbonate and another coarser aluminium sample were ineffective.

It is concluded that there is a good correlation between the increased rate of phagocytosis and the beneficial effect of the dusts in the silicosis experiments, and that aluminium metal and Sucal would have a prophylactic effect in protecting men against silicosis in practice.

G. Nagelschmidt

NAGELSCHMIDT, G., NELSON, E S, KING, E. J & HARRISON, C. V **The Development of Lymph Nodes after Injection of Flint of Variable Size into the Lungs of Rats.** *Brit. J. Indust. Med* 1954, Apr, v 11, No 2, 145–50, 2 figs

Lymph nodes were examined from 2 series of experiments in which 50 mgm of 5 different sizes of flint particles were injected into the lungs of rats. The sizes were < 0 5, 0 5–1, 1–2, 2–4, and 4–8 μ equivalent diameter. All the dust was given in one or a few doses. The animals were killed at various stages up to 500 days. The lymph nodes were dissected out and weighed and the amount of flint in the nodes was determined. Flint in the middle range of particle sizes produced the maximum effect in the lymph nodes as well as in the lungs. The nodes were bigger, they contained more flint, and developed more fibrosis. With the smallest particles the nodes increased in size rapidly, but showed no increase after 6 months when they contained less total flint with less fibrosis than for the middle sizes-range of particles. Possibly these small particles are easily transported to the nodes and, later, partly passed on to other sites and partly dissolved. At the other end of the scale, particles of 4–8 μ caused less deposit in the nodes and less fibrosis owing to the mechanical difficulty of transporting particles of this large size. The recovery in the nodes of the small particles administered after one year reached 18 to 20 per cent. But a total recovery from lung and nodes for all sizes may reach 50 per cent

E. L Collis

NORDMANN, M., LOBLICH, H. J. & KOCH, W. Zur Pathologie der Lymphstrombahn Resorption und Transport von Quarzkristallen bei Lebendbeobachtung bis zu 18 Tagen. **[Pathology of Lymphatic Drainage. Resorption and Transport of Quartz Crystals as observed in the Living Animal up to 18 Days]** *Beiträge z Silikose-Forschung.* 1954, No. 28, 51–64. [11 refs.]

In continuation of previous work with dyestuffs quartz was injected intraperitoneally into rabbits and its transport observed *in vivo* in the pancreatic region or in the mesentery.

The quartz crystals used were 6–12 microns in diameter and they were observed in the polarizing microscope between crossed Nicol prisms and using a quarter wavelength gypsum plate, so that the crystals appeared blue or yellow. Observations were made

uring life and confirmed later on by normal histo-gical methods

It was found that the quartz crystals moved much ore slowly in the lymph stream than the erythro-tes, single crystals or groups usually moving freely nd not in dust cells. Groups of crystals formed ggregates with fibrin and such groups were also seen side macrophages

Large depots of crystals, usually near the site of jection, caused capsulation and formation of giant lls

[The authors do not comment on the fact that the ze of quartz dust used is much larger than that of ust found in silicotic lungs] *G Nagelschmidt*

OSTHOFEN, H Über die Bedeutung des Ductus thoracicus bei Silikose **[The Importance of the Thoracic Duct in Silicosis]** *Beiträge z Silikose-Forschung* 1953, No 20, 23–36 [46 refs]

There is here first described and discussed some of e work that has been done on the systemic spread ot only of carcinoma and tuberculosis but also of organic particles as in anthracosis, through the oracic duct Some of the anatomical facts and post-ortem data of cases in which metastatic spread has ccurred are described On the basis of these it is ggested as a possibility in silicosis that there may ccur a retrograde spread against the flow of lymph n the thoracic duct or through anastomoses between [illegible]

t has been shown that silica particles cannot pass hrough them *M E Delafield*

WORTH, G & CAMPEN, G Beeinflusst die Silikose den Kieselsäurespiegel im menschlichen Blut ? **[Does Silicosis affect the Silica Content of Human Blood ?]** *Hoppe-Seyler's Ztschr physiol Chem* 1951, Nov , v 288, Nos 4/6, 155–64 [24 refs]

As the authors had access to a large number of [illegible]

values in the method which is a variant of the molyb-denum blue technique, described by KRAUT and WEBER in 1942 [this *Bulletin*, 1943, v 18, 393] The mean result for the whole group was 8 3± 2·4 μgm SiO_2/ml of blood Neither sex, different kinds of inflammatory or other diseases, nor silicosis caused any significant difference in the silica content of the blood Tests were also made after ingestion of organic silicon compounds Here a rapid rise of silica content of blood and urine was found, but the blood silica had dropped to its normal value after 9 hours

The bearing of these findings on the silica solu-bility theory is discussed If the theory is to be maintained, then it must be assumed that the amounts dissolved are too small to be demonstrated in the blood or that excretion through the kidneys is too rapid *G. Nagelschmidt*

WORTH, G Der Kieselsäurespiegel im menschlichen Blut **[The Silica Content of Blood]** *Klin Woch.* 1952, Jan. 15, v. 30, Nos. 3/4, 82–3, 2 figs.

[illegible]

(1942)

The average values for 210 men were 8 4±2 4 γ, and for 54 women 8 0±2 5 γ per ml. A slight statistically significant difference for age was also present—up to 25 years 9 1±1·4 γ , over 50 years 8·2±1 9

Estimations of groups suffering from various illnesses, including slight, moderate and severe silicosis, inflammatory diseases, tumours, blood disorders, metabolic and hormonal disorders, revealed no significant variation in the SiO_2 content of the blood

[illegible]

DESOILLE, H , DÉROBERT, L., LE BRETON, R , LAFUMA, J & VACHER, J La silicémie; sa signification physiopathologique dans la silicose **[Silica in the Blood; its Physiopathological Significance in Silicosis]** *Arch. Malad Professionnelles* Paris 1955, v 16, No. 1, 5–19, 5 figs. & 6 charts

[illegible]

* v II, 113

into the blood and into other organs (spleen, liver and kidneys) as well as the lungs. The presence of this non-crystallized silica exerted a special physio-pathological significance *E. L. Collis*

SARTORELLI, E., CAMBRUZZI, S & TOSO, Ada. Il tempo di lisi del coagulo (fibrinolisi) nella silicosi. **[Time of Solution of Blood Clot (Fibrinolysis) in Silicosis]** *Med. d. Lavoro.* 1953, May, v. 44, No 5, 218–24 English *summary*. [Numerous refs]

These researches were carried out on 15 patients with uncomplicated silicosis (absence of tuberculosis, pulmonary or extra-pulmonary). The authors' method was as follows 9 cc. of blood are taken from a vein, when the patient is at rest and fasting, into a tube containing 1 cc. of 3 8 per cent. sodium citrate and centrifuged for 10 minutes at 2,500 r.p.m ; 0 5 cc. of the plasma is placed in a Wassermann tube, 0 5 cc of 1 18 per cent. $CaCl_2$ solution added and after being shaken the whole is placed in a thermostat at 37°C and the time at which complete solution of the coagulum takes place is noted The operation is carried out under asepsis.

The results in the 15 patients are given in a table comparing these with the average of 5 normal subjects The lysis time *of the normal subjects* was 200 hours, in 13 of the patients it ranged between 70 and 96 hours, the other 2 gave readings of 120 and 134 hours, these were the longest and well below the average of the healthy The total proteinaemia was little changed, being 7 40 gm per cent. and the 13 varying between 6 27 and 8 43, the albumin/globulin ratio was well below the normal (1 45) in 13, the lowest being 0·68 and the highest 1 06; 2 others—the same as those who had the longest lysis time—had ratios of 1 31 and 1 22; lastly, the gamma-globulin, normal 0·9 gm per cent., was increased in all, the lowest being 1·14 and the highest 2 70, 6 being in the 1 6 group

The study was undertaken *because of* certain analogies between silicosis and hepatic cirrhosis, in both of which hyperglobulinaemia and hypo-albuminaemia are present *H. Harold Scott*

SARTORELLI, E., CAMBRUZZI, S. & BELLAMIO, C Il processo di coagulazione del sangue nella silicosi **[Blood Coagulation Process in Silicosis]** *Med d Lavoro.* 1954, Apr., v. 45, No. 4, 225–31 [Numerous refs.] English summary

The kno[illegible] which is already available on the subject of [illegible] to the au[illegible] agulation [illegible] studies th[illegible] thrombin time and Howell's method [illegible] clotting time in the presence of calcium ions in the case of 15 subjects, aged 31–53 years, who had active silicosis uncomplicated by any active tuberculous process. For each case they have estimated the total [illegible]

studies.

They have found an increase in blood coagulability in every case and this is attributed to increased activity of prothrombin associated with a reduction of the blood albumin and a rise in the blood globulins They deduce a rise in the plasma concentration of prothrombin and of other accelerating factors and consider that these manifestations are connected with the blood protein changes which are known to be characteristic of silicosis. *J. Cauchi*

BAUER, H. Bluteiweissfraktionen bei Silikose und Siliko-Tuberkulose **[Blood Albumin Fractions in Silicosis and Silico-Tuberculosis]** *Arch f Hyg. u. Bakt.* 1950, v. 133, No 4, 265–70, 1 fig

Three problems in the diagnosis of silicosis were examined in distinguishing inflammatory complica- [illegible] from uncomplicated [illegible] used by [illegible] damage [illegible] licosis. [illegible] gation at [illegible] or about [illegible] ave been [illegible] reaction [illegible] e [ESR] [illegible] mmatory is by itself a certain [illegible] process, that is, it may be negative in the presence *of inflammation, or positive in its absence.* The inflammatory complication may be of exudative or fibrotic type; is there a test which goes farther than the ESR in distinguishing these two types of process? With the Weltmann coagulation test a definite shortening to 4 or *under* is a warning of the exudative type; in 600 cases, 81 with a shortened Weltmann Series of 4 or less [see PAULA, this *Bulletin, 1950, v. 25, 1255*] included 41 of definite active tuberculosis, 17 suspicious, and *5 of other inflammatory* complications. In certain cases the Weltmann test gives an *inconclusive* result, in such cases the Costa reaction, the cadmium sulphate reaction and the formol-gel reaction have been used.

With the Costa reaction, in a series of 237 cases 27 were positive, whereas ESR was normal; *of the 27, 6 were active tuberculosis,* two of them open, and one was tuberculous meningitis. With the cadmium sulphate reaction results were less *certain*; [illegible] positive result was obtained in 18 4 per [illegible] of non- [illegible] cent. of [illegible] ormol-gel [illegible] admium [illegible] sulphate test. From present expe[illegible] th these

* v. II, 118.

three tests it cannot be said that they clarify an indecisive result from the Weltmann test.

A number of other reactions described in the literature have been tested and, as a result, two

E L Middleton

BALDI, G & BOSELLI, A Ricerche sul valore dell'analisi delle gamma-globuline nella prognosi della silicosi **[Researches on the Importance of the Analysis of the Gamma Globulins in the Prognosis of Silicosis]** *Med d Lavoro* 1953, Dec, v 44, No 12, 501-11, 2 figs English summary

Previous workers in this field [this *Bulletin*, 1950, v 25, 1147] had already noted a rise of the serum globulins, and more especially of the gamma globulins, in silicosis They next observed that the rise was mainly due to the gamma euglobulin fraction when fibrosclerosis was the predominant process and to the

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pseudoglobulin fractions can be separately studied more or less quantitatively by precipitating the former in the presence of certain buffer solutions (Boselli's reaction) An increase of the pseudoglobulin fraction can in this way be indirectly detected and may indicate, among other changes, the formation of antibodies

The authors have studied the cases of 269 subjects with silicosis and followed them up for 1 to 2 years, estimating the gamma euglobulin content of the serum in each case, they found this to be above normal values in 60 *per cent of cases at the first* examination These raised euglobulin values appeared less frequently when there was a complicating infection. There were less definite indications of a direct relationship between an increase of these values and the progressiveness of the silicotic process The euglobulin values by themselves, therefore, would appear to be of little assistance in either diagnosis or prognosis, but the follow-up has shown raised values of the total gamma globulins which had been found in the serum *at the initial* examination, 1 to 2 *years before, of those* patients who had subsequently died or otherwise become worse

The authors have estimated the total value of gamma globulins in the serum of 117 cases by electrophoretic methods and re-examined 57 of these within about a year They measured indirectly the values of the euglobulin and pseudo-globulin fractions and found that a significant proportion of progressive, sometimes fatal, cases showed that the rise in the total value (electrophoretic test) was due mainly to

* v II, 116

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Yauchi

CHRISTIAENS, L, BALGAIRIES, E, CLAEYS, C. &

A study was made to ascertain whether in cases of silicosis the constituents of the serum undergo any change which might be of value in diagnosing doubtful cases Increase in rapidity of sedimentation of red cells has been claimed, but it has proved only a statistical entity, not to be trusted for individual cases Haptoglobinaemia [alpha 2 globulinaemia] tests were tried, but the modifications encountered

those obtained from a group of normal miners.

cotics were investigated Further study may bring to light some modification in the serum constituents in silicotics, but the present study has not done so.

E. L. Collis

BOSELLI, A & DELLA PORTA, G. Rilievi sulla

colare sui

polmonare.

erence to

Silicosis]

, No 11,

The English summary appended to the paper is as follows —

"Fifty two workers with simple pulmonary silicosis and twenty four with silicosis accompanied by associated infectious disease (almost all—that is to say 22 cases—being of tubercular type) were

total protein

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and nine

od proteins

In 58 per cent. of the silico-tuberculosis cases blood albumin was below normal; i.e. 21% slightly and 37%, markedly diminished (under gr. 3 per cent.). The electrophoretic alpha globulins were normal in 96 per cent. of the cases of simple silicosis, but showed an increase in 71 per cent of the cases of silicosis associated with infection. The electrophoretic gamma globulins were definitely above normal in 75 out of 76 cases In 75 per cent. of all cases levels were of

globulins, probably gamma antibodies) and were clinically characterised by silicosis associated with acute infections of specific or non-specific type. The type

82 per cent. of the cases of silico-tuberculosis and of other associated infections."

BECKMANN, H, ANTWEILER, H. & HILGERS, A. Elektrophoretische Untersuchungen der Serum-Proteinfraktionen bei Silikosen und Siliko-Tuberkulosen im Vergleich mit verschiedenen Serumlabilitatsreaktionen. **[Electrophoretic Study of Serum Proteins in Silicosis and Silico-tuberculosis, together with various Serum Lability Tests]** *Beiträge z. Silikose-Forschung.* 1953, No. 20, 1-21. [24 refs.]

The authors examined 537 miners in the Ruhr area of Germany, 211 suffered from pure silicosis and 73 from silicosis plus tuberculosis A number of laboratory tests were performed to see whether there was a correlation between them and the severity of the disease or the course it took. The serum proteins were examined by *filter-paper electrophoresis* and lability tests were carried out The total serum protein level was determined by the copper sulphate specific gravity method. The erythrocyte sedimentation rate was also measured. There was in all cases a fall in the albumin level with a corresponding rise in the γ-globulin percentage. The total serum protein remained within normal limits There was no difference between pure silicosis and silico-tuberculosis but the more severe the disease the more pronounced was the change in the serum-protein composition. The erythrocyte sedimentation rate, and of the various lability tests the Weltmann band and the Takata test, seemed to be the more enhanced the higher the γ-globulin rose, but there was no constant correlation. There was even less correlation between γ-globulin level and the results of thymol turbidity test cadmium-sulphate precipitation and cephalin-cholesterol flocculation. *H. Lehmann*

PROYARD, G. & NIZET, A. *Observation sur l'analyse électrophorétique des protéines sériques dans la silicose* **[An Observation on the Electrophoretic Analysis of Serum Proteins in Silicosis]** *Arch Malad. Professionnelles.* Paris, 1955, v 16, No. 1, 20-26

the importance of associated tuberculosis may be assessed. In order to test this claim observations were made upon, (a) 40 normal persons chosen at random, (b) 26 underground miners apparently normal with no X-ray signs, and (c) 35 silicotics, of whom 24 were medium cases and 11 had advanced silicosis; in no case was tuberculosis thought to be present. The findings of serum proteins in these groups are presented in tabular form. When these results were compared, no differences were found until the advanced cases of silicosis were considered. Here an elevation in the alpha, globulins was noted which seemed to be associated with necrosis; it was similar to what occurs in the days after surgical procedures. Even then the gamma globulins remained normal The authors consider the claim advanced to be illusory and fallacious. *E L. Collis*

FOUBERT, P & LA FAY, G. La vitesse de sédimentation sanguine au cours des silicoses. **[The Rapidity of the Sedimentation of the Blood during the Progress of Silicosis]** *Rev. Méd. Minière* Douai 1950, v. 3, Nos. 9/10, 19-35, 33 charts. [15 refs]

A short summary is given of previous observations on the rapidity of the sedimentation of the blood in

however, have been made on isolated cases ... present research was made on large groups of case... The method used of estimating the rapidity of sed...

[illegible]

periodic X-ray examinations Allowance having been made for chance outside influences, the sedimentation curve would appear to be the most precise indication we have of the progress of silicosis, it is more reliable than an eosinophile count or the pressence of granulations in the leucocytes

E. L. Collis

GILLI, R. Contributo allo studio della crasi ematica del silicotico **[Haematological Findings in Silicosis]** *Med d Lavoro* 1952, Mar, v. 43, No 3, 115–23 [31 refs]

The English summary appended to the paper is as follows —

[illegible]

however a clear indication of increase in the eosinophil and monocytic counts, statistically significant when compared with that of the control group. The author advances the hypothesis that this increase may be the expression of mesenchymal reaction to SiO_2, the conclusion is drawn that, in simple silicosis, hematological findings are of slight diagnostic significance, but are of assistance in excluding associated tuberculosis"

BALGAIRIES, E & CLAEYS, C Contribution à l'étude hématologique de la silicose **[A Contribution to the Study of the Blood Picture in Silicosis]** *Rev. Méd Minière* Douai. 1952, v 5, No 18, 13–27. [65 refs.]

A search over previous reports upon the haematology of silicosis established considerable disagreement; hence the present study. Red cells were examined in 415 miners whether silicotic or not

[illegible]

subjects were examined Of them 64 were non-silicotic miners; 96 had slight signs of silicosis; 48 were more advanced, 111 had confluent shadows, and 39 were advanced cases Here again the data collected are presented in great detail and distributed according to the extent of the silicotic state. A [illegible] onsidered [illegible] definite [illegible] pea, as a [illegible] n in the [illegible] to have [illegible] umed by

others. The conclusion is presented that a haematological approach in diagnosing silicosis has no sure basis. Nevertheless, a clear difference between the [illegible]

BALGAIRIES, E. & CLAEYS, C. Etude hématologique de l'hypoxie dans la silicose **[Haematological Studies in the Hypoxaemia of Silicosis]** *Arch. Malad Professionnelles* Paris. 1953, v. 14, No 1, 12–18. [27 refs]

See this *Bulletin*, 1953, v. 28, 262

FRIEHOFF, F & KARRASCH, K., with a foreword by V. REICHMANN Das Verhalten von Sauerstoffdruck und Sauerstoffsättigung bei chronischen Lungenerkrankungen unter besonderer Berücksichtigung der Silikose **[Oxygen Pressure in relation to Oxygen Saturation in Chronic Lung Disease with special reference to Silicosis]** *Beiträge z. Silikose-Forschung* 1954, No 26, 1–79, 27 figs [59 refs]

This is an account, published by the Silicosis [illegible]

together with 100 continuous oxymetric measurements In 8 patients the pressure in the pulmonary artery was determined by means of the Cournand catheter. Oxygen pressures were measured by the "Hämoxytensiometer" (BARTELS and LAUE) and oxygen saturation by means of the "Hämoreflektor" and "Zyklop" after BRINKMAN.

[illegible]

oxygen saturation and pure primary respiratory insufficiency in which no such diminution occurs.
M. E. Delafield

SAITA, G. & DI NARO, C. Il midollo osseo nella silicosi. **[The Bone Marrow in Silicosis]** *Med. d. Lavoro.* 1951, June–July, v. 42, Nos. 6/7, *201–15, 9 figs. [34 refs.]*

The English summary appended to the paper is as *follows* :—

"For 20 cases of silicosis (11 cases of silicosis at different stages and 9 cases of silicosis with active tuberculosis) myelograms were studied by means of *sternal puncture.*

"In pure silicosis there were no particular modifications of the granuloblastic and erythroblastic series; only in some cases a slight hypoplasia of the granuloblastic series was found; the maturation curves were practically normal. In *silicosis with* active tuberculosis the myelogram was similar to that found in chronic infections, with an increase of the granulo-erythroblastic index, hyperplasia of the granuloblastic series and metamyelocytosis *of the* marrow · only in one particularly serious case the marrow was comparatively immature, showing increase in the myeloblasts and promyelocytes. Sometimes the myelocytes and metamyelocytes [illegible]

hyperplasia and activation of the mesenchyme, as proved, by recent work, to exist in all the organs of silicotics. The increase of the histoid proliferation index appeared to be more marked in the case of silicosis with tuberculosis. In silicosis the mesenchymal activation is often accompanied by dysproteidemia no obvious parallel has however been verified between dysproteidemia and increase of the histoid proliferation index"

RAULE, A & GRISLER, R La funzionalita' corticosurrenale nei silicotici **[The Suprarenal Cortex in Silicosis]** *Med d Lavoro* 1950, Aug–Sept., v 41, Nos. 8/9, 243–6 English summary

Thorn's test has been applied to 9 cases of silicosis where there was also active tuberculosis, and to 13 other cases where the silicosis was not so complicated A table gives the result of the test as well as the following other clinical particulars for each case :—Body weight, blood pressure, skin reaction to tuberculin, sedimentation rate, confirmation or exclusion of [illegible]

The results of Thorn's [illegible] insufficiency of the suprarenal cortex in 8 out of the 9 tuberculous silicotics and in 6 out of the 13 others The output of neutral 17-Ketosteroids has been found lowered in 10 patients in whom an

[illegible]

chronic exhaustion of the suprarenal cortex.
J Cauchi

RAULE, A. La depressione corticale nei silicotici: considerazioni critiche e rilievi clinici **[Adrenal Cortical Depression in Silicotics: Critical Observations and Clinical Findings]** *Med d Lavoro.* 1952, Aug.–Sept., v. 43, Nos 8/9, 315–21 [*24 refs*] *English summary.*

In the medical examination of cases of silicosi[s in] connexion with claims of compensation for incapac[ity] it is not sufficient to limit the investigation to [the] chest and the pulmonary function Other org[ans] and functions may have suffered as a result of t[he] occupational risk Signs and symptoms of adrenal insufficiency may be present Post-mort[em] examination has not infrequently revealed t[hese] changes in the adrenal gland which suggest exhausti[on] [illegible]

period of 10 years, and who had shown no eviden[ce] of tuberculosis: 51·6 per cent of these had co[m]plained of some degree of anorexia, and 62 per cen[t] of asthenia: 32 2 per cent. of those over 60 had [? systolic] blood pressure reading of under 120 m[m.] and this reading was below 110 mm. in 26·7 per cen[t] *of all the subjects.*

The [illegible] number of other observatio[ns] [illegible]

tuberculosis could be excluded, and the results in 6 of these pointed to a functional deficiency of t[he] adrenal gland.

The mechanism and pathology of the chang[es] referred to above are discussed in Raule's paper.
J Cauchi

GOMIRATO, G. & MASOERO, A. Sulla patogene[si] della leucoencefalite sperimentale da inalazion[e] di polvere di silice **[On the Pathogenesis [of] Experimental Leuco-Encephalitis from Inhalatio[n] of Silica Dust]** *Med. d. Lavoro. 1951, Dec* v 42, No 12, 370–82, 10 figs. on 4 pls [Numerou[s] refs] English summary.

Twelve rabbits were exposed to repeated inhalations

COLLET, A. & MOUSSARD, H Elimination de silice par la voie biliaire Etude expérimentale chez le lapin **[Excretion of Silicon in the Bile. An Experimental Study on Rabbits]** *C R Soc. Biol.* 1952, Oct, v 146, Nos 19/20, 1574–7, 2 figs

When ascertaining the elimination of silica by the kidneys, there is need to know whether it is also being eliminated by such other means as the bile In order to study this matter, 7 rabbits, with 6 controls, were given injections into the saphenous vein of 1·25 cc of a suspension of silica in distilled water Every hour samples of bile were collected and analysed by the micro-colorimetric method. The results are set out in tables which clearly establish that the amount of silica excreted by the bile is very minute compared with the amount injected It varied among the different rabbits In comparison, other observations have shown that in the dog about half the silica introduced is eliminated by the kidney, an observation confirmed by peritoneal injection of radio-active silica. The conclusion is that the bile does not introduce an appreciable source of error in the study of elimination of silica by the urine, which seems to constitute the normal path of excretion *E. L Collis*

SECTION IV

SILICOSIS—CLINICAL STUDIES

Respiratory and Cardiac Functions: tests—Radiology—Clinical Findings—Complications

WRIGHT, G. W **Functional Abnormalities of Industrial Pulmonary Fibrosis.** *Arch Indust. Health.* Chicago. 1955, Mar., v. 11, No 3, 196–203.

This is a general account of respiratory physiology and its modifications in silicosis and asbestosis, written in terms comprehensible to the intelligent layman. It records the finding that in general the changes in silicosis are similar to those of obstructive emphysema, whereas in asbestosis there is impairment of oxygen transfer in the lung There is a poor relation *in both conditions between radiological and* physiological measurements *C M. Fletcher*

SANTENOISE, D., MATTEI, J., PERRET, A. & ROCHE, M. Étude de l'excitabilité des centres respiratoires et des centres sympathiques vaso-pulmonaires chez les silicotiques. **[A Study of the Excitability of the Respiratory Centres and the Sympathetic Vaso-Pulmonary Centres in Cases of Silicosis]** *Arch. Malad Professionnelles.* Paris. 1950, v. 11, No. 3, 277–83.

The authors are interested in the exact causation of incapacity in cases of silicosis, and decided to study the excitability of the respiratory centres in such cases Finding that the spirometer did not give sufficiently precise results, they devised a different method. *The person under observation inhaled air* containing various concentrations of carbon dioxide (from 4 per cent to 8 per cent were used). For this [illegible] chosen. The depth of the involuntary [illegible] breathing which resulted was recorded. The test indicated *the existence,* in silicotics, of profound alterations in the excitability of the respiratory centres which only came into play after very abnormally high concentrations of CO_2 were inhaled. Silicotics who were in hospital displayed reactions more in accord with normal than other silicotics Another point was that the intensity of the reaction seemed to be out of proportion to the X-ray findings and to anticipate them. This reaction has been *found in other* lung troubles, such as asthma, chronic bronchitis and tuberculosis.

In order to study the excitability of the sympathetic vaso-pulmonary centres recourse was had to tensiographic observations of the effects of abdominal compression upon the systolic and diastolic pressure Sometimes this pressure sends up both systolic and *diastolic pressures; at others the diastolic pressure* is raised, but the systolic is considerably lowered [illegible] silicotics the existence of interferences with the *normal chemical* and reflex control of *breathing* involving an abnormal tendency to develop anoxaemia and *dyspnoea; these interferences may precede* any X-ray indication of the presence of silicosis and this point requires study. *E. L. Collis*

ROCHE, L & BERTOUT, A Intérêt pratique de la *pneumotachographie dans l'expertise* de la silicose **[The Practical Value of the Pneumotachograph in the Diagnosis of Silicosis]** *Rev Méd Minière.* Douai 1951, v. 4, Nos 15/16, 12–15, 10 figs

The authors describe fairly clearly an apparatus, called a *pneumotachograph,* devised by Prof FLEISCH, which they have been using for several years They claim that it is simple to use and a number of examinations can be quickly recorded By its means records can be made of breathing at rest, deep and shallow breathing, the moment of maximum expiration, and pulmonary ventilation *after trial exertion. Samples of such records* are reproduced The general picture of the curves is a matter of considerable importance Thus gross functional trouble is portrayed by curves exhibiting respiratory rapidity, prolonged in duration, followed by short and deep inspiration. If enough data have been collected, the subjects observed may be placed in 4 groups · *normal persons, persons* slightly affected, those moderately affected and the severely affected The principal interest in this method of examination is that it provides a record which is outside the subject's power to modify. *E. L Collis*

FOURERT, P, BALGAIRIES, E. & QUINOT, E. Recherches sur les échanges respiratoires chez l'ouvrier mineur au travail. **[Studies in Respiratory Exchange in Miners at Work]** *Arch. Malad. Professionnelles.* Paris 1953, v. 14, No 1, 5–11, 4 figs.

This study among miners with normal basal [illegible]

laboratory Expired air for analysis was collected by the Douglas bag method and the oxygen consumption was estimated with the Orsat apparatus in which CO_2 is absorbed over caustic soda

The oxygen consumed was proportional to the work done and this enabled tabulation of results according to the type of work performed and a comparison to be made with ergometric laboratory results

Hyperventilation was found underground when results obtained there were compared with figures obtained under laboratory conditions for the same subject doing the same work with the same oxygen consumption. This hyperventilation was constant, the ratio of pulmonary ventilation underground to that at the surface being 1 4 For work performed for 0 to 240 watts, the relation of $\frac{O_2 \text{ used} \times 100}{\text{pulmonary ventilation}}$ was 4 5 at the surface and 3 2 underground The latter figure may also be obtained by dividing 4 5 by 1 4

Examination of conditions underground which might cause this hyperventilation led to the belief that it was due partly to the humidity (75–83 per [illegible]

SIMONIN, P., DRUTEL, P & DECHOUX, J L'insuffisance ventilatoire dans la silicose pulmonaire Étude spirographique **[Respiratory Insufficiency in Silicosis. Spirographic Study]** *Arch Malad Professionnelles* Paris 1953, v 14, No 5, 461–8 [10 refs]

FOUBERT, P., NADIRAS, P. & BATIQUE, L. La spirographie au repos dans la silicose Sa valeur et ses limites **[Spirography during Rest in Silicosis; its Value and Limitations]** *Rev Méd. Minière.* Douai 1954, v. 7, No 25, 3–18, 5 graphs. [30 refs.]

The value of spirometer readings in representing the functioning activity of the lungs is discussed at some length. Some readings are thought to be of more use than others; those finally considered useful are [illegible]

miners The spirometer readings took about ½ hour each, giving a total of some 15 per day. Next the X-ray findings of the chests of these men were obtained and grouped according to the Cardiff-Douai scale. The data so gathered were then submitted to statistical investigation

The results are portrayed in a number of graphs from which conclusions are drawn; pulmonary function shows little, if any, sign of reduction so long as the X-ray findings are those of early to moderate fibrosis of silicotic origin But when these shadows indicate advanced fibrosis, the spirometer readings indicate how far the functional capacity is limited. Changes in spirometer readings may, then, be used to detect any advance in functional incapacity.

E L. Collis

KARRASCH, K & SCHMIDT, O Funktionsanalytische Untersuchungen unter besonderer Berucksichtigung der gebrauchlichen ergometrischen Verfahren **[An Investigation of Functional Tests with special reference to Ergometric Techniques in Current Use]** *Beiträge z. Silikose-Forschung.* 1954, No 27, 19–52, 13 figs [36 refs]

The latest German Silicosis Compensation Law of 1952 lays less stress on radiological signs but puts increasing emphasis on impairment of function of the respiratory and circulatory systems What is in fact compensated now is lack of earning power This requires more accurate and objective functional tests from the assessors of claims, and the present paper deals with ergometry

After a few physical and physiological definitions have been given, 6 types of ergometric test are described, which were all used side by side in the present work They are knee-bending test, James Box test, two-step test according to Master, bicycle ergometer, crank ergometer and running platform [illegible]

(doctors) The tests were so adjusted that a constant effort, 60, 90 and 120 Watt under steady state conditions, was maintained, and, apart from lung ventilation results, oxygen consumption and pulse frequencies were determined With the first 3 tests it was found impossible to reach 120 Watts In the order of the tests given above the efficiency increases, as illustrated by the following figures

	Oxygen consumption in cc./min. 60	90	120	Watt
Knee-bending	1230	1830	—	
James Box	1260	1790	—	
Two-step	1400	1980	—	
Bicycle	991 ± 101	1191 ± 111	1494 ± 64	
Crank	932 ± 68	1200 ± 110	1579 ± 102	
Running platform	766	996	1267	

Apart from these tests, others were done increasing the working load regularly until exhaustion The obtainable maximum of work increased in the order: James Box, knee-bending, two-step test, crank, bicycle and running platform This order held for all subjects tested irrespective of the actual peak performance obtained.

The oxygen consumption of the people not used to manual work under steady state was on an average 20 per cent higher than that of the miners

The results are compared with those of other workers ...

able to use a number of ergometric tests rather than one alone, and that ergometry is only an aid in clinical studies and not an end in itself.

G Nagelschmidt

LUCHSINGER, P & BÜHLMANN, A Die Lungenfunktion bei der Silikose und die Prognose nach Aufhören der Staubarbeit. **[Lung Function in Silicosis and Prognosis after Cessation of Exposure to Dust]** *Ztschr. f. Unfallmed u Berufskrankh.* 1953, Dec. 15, v. 46, No 4, 282–8, 3 figs

The authors have attempted to determine whether lung function in silicosis bears any relation to the radiographic variations; whether there is any difference in functional condition in different occupational groups, and what is the progress of silicosis after cessation of exposure to dust.

The 300 men investigated included 105 miners, 18 sand blasters, 44 foundrymen, casters and core makers, 52 stone hewers and stone breakers and 9 metal grinders ...

... longest in the stone hewers and breakers, shortest in the miners and sand blasters

Lung function is classified as "latent" or "manifest" insufficiency, "latent" denoting a decrease in the basic respiratory and vital capacity with normal oxygen saturation of arterial blood, "manifest" an under-saturation of arterial blood with diminished or occasionally normal respiratory reserve.

In individual cases no relation was found between X-ray variations and lung function, but on the average the lung function deteriorated with increasing X-ray signs.

There was no essential difference in functional condition in ... stone hew... their grea... insufficiency.

With regard to the prognosis after removal from exposure, investigation of 46 patients (all but 3 in Grades I and II) at least twice at intervals of 2 or more years, showed that in more than half the lung function and X-ray picture had remained stationary, and in a quarter the lung function had improved. Only 3 had deteriorated; these had been Grade III when first investigated

Ethel Browning

ROSSIER, P. H , BÜHLMANN, A. & LUCHSINGER, P. ...

... *med. Woch.* 1955, Apr 22, v. 80, No. 16, 608–14, 6 figs. & 1 diagram.

The authors describe their tests for determining lung function, the differentiation and classification of the various kinds of respiratory insufficiency and the connexion between these and the pulmonary circulation. Disturbances of lung function in the early stages of silicosis are mostly concerned with ventilation and are less the result of changes in the lungs caused by silicosis itself, than of complications such as chronic bronchitis and emphysema; in the progress... with the ... num... there ... chan... ance ... by work tests, gives an objective criterion for assessment of incapacity. When silicosis is diagnosed at an early stage the patient is protected from further exposure to dust, and the prognosis regarding progression of the disease and incapacity for work is improved. Where silicosis has led to respiratory insufficiency treatment must be given, by inhalation therapy, breathing exercises, and the artificial increase of ventilation with suitable apparatus (respirator, iron-lung, electro-lung). Where chronic ...

evidence of a progressive condition which, in most cases, has already led to severe functional disturbances. In Switzerland silicosis is compensatable, not as a disease, but only through resulting incapacity for

work; this leads to early diagnosis since the worker exposed to dust complains as soon as there is any sign of chest trouble. Most of these patients are excluded from further work exposing them to quartz

from those due to accompanying diseases It often remains a question of degree how far accompanying diseases can be traced back to the occupational disease or to other causes

The basis of all research on respiratory function is spirometry and analysis of the gases in the arterial blood A combination of these two affords a view of the disturbance of function and the patho-physiology of the mechanism of adaptation Recent research has shown how closely the ventilation of the alveoli and

circulation

obtained by puncture with a fine cannula from the brachial or femoral artery, the oxygen is estimated by

giving information on conditions of pressure in the pulmonary circulation

A classification is given of the different disturbances of lung function and these are discussed very fully, they include latent insufficiency, in which are distinguished partial and global insufficiency, disturbance of diffusion related to pneumoconiosis, pulmonary hypertonus due to reduction in the surface of the

there were some with advanced disease in whom respiratory insufficiency could not be proved The occurrence of pulmonary hypertension in more advanced stages of silicosis, arising from insufficiency, leads to cor pulmonale, the prognosis and treatment of which are described.

Assessment of capacity for work is made on the

On the question of progression of silicosis after removal from exposure to dust a study of 46 silicotic workers showed that, after at least 4 years' freedom

In this discourse the author outlined thet heoretical considerations involved in the effect of silicosis on the pulmonary functions, the practical conclusions

rest and loss of muscular exercise.

The practical conclusions which follow are that: spirometry is indispensible, since neither clinical nor radiological examination can disclose defects of the pulmonary ventilation due to silicosis; alveolar

centres

At Lausanne spirometry is carried out on apparatus

mentary means.

E. L. Middleton

JÉQUIER-DOGE, E. & LOB, M. L'estimation de la capacité de travail dans la silicose à l'aide d'enregistrements spirométriques durant l'effort. **[Estimation of Working Capacity in Silicosis by Spirometric Records Taken during Effort]** *Arch. Malad. Professionnelles.* Paris. 1950, v. 11, No. 4, 349–56, 5 figs

ism.

The authors show the value of spirometric measurements recorded at intervals over a period of years, and under varied conditions of rest and effort, and with supply of air and oxygen, in estimating the functional cardio-respiratory reserve. Three cases presenting difficulty of assessment owing to complication by neurotic tendencies were observed during several years and are described in detail. Estimation of working capacity by clinical methods alone led to error; spirometric examinations at rest gave varied results ... patient, ... ysical record ... gave effort ... pnoea more

E. L. Middleton

JÉQUIER-DOGE, E. Estimation de la capacité de travail dans la silicose. **[Estimation of Working Capacity in Silicosis]** *Med d Lavoro.* 1952, Feb., v. 43, No. 2, 55–60, 1 fig. [15 refs.]

The author describes the methods used in Lausanne for more than 10 years A modification of Knipping's apparatus is used, by which the patient breathes air in a closed circuit; the respiratory movements are recorded graphically.

Examples of the application of the method are given. They include the examination of a non-co-operating insured person where the vital capacity varied with each test (the record is made behind the patient); when CO_2 was mixed with the air breathed the ventilation was more than doubled. Records made by athletes show that the method gives a better estimate of the capacity for effort than values recorded at rest. Another example shows the effect on the records of an intercurrent infection in a silicotic patient undergoing treatment for purulent sinusitis. It is important to take into account such conditions which may affect the spirometric results. Functional tests based on spirometric records made before, during, and after physical effort are satisfactory because they allow physio-pathological interpretations to be made. However, the methods require complicated and costly installations, the manipulation of which is not rapid or simple, and causes of error are sometimes difficult to trace

For two years the oxymetric method of MILLIKAN has been employed, by which the oxygen saturation of the blood can be determined from a sample of blood taken from the lobe of the ear. By combining oxymetry and ergometry it is sought to establish at what amount of effort, established ergometrically, the pulmonary function maintains a physiological oxygen saturation of the blood, and at what point it fails to do so.

It is emphasized again that, in spite of the accuracy of figures, the results have only a limited practical value; this is due to the short duration of the tests and the special conditions under which they are made altitude, purity of atmosphere, and rest in hospital. For these reasons the laboratory findings must be integrated with the history, and the results of clinical and radiological examinations.

E. L. Middleton

PASARGIKLIAN, M., SARTORELLI, E & GIORGI, E Sull'insufficienza respiratoria d'origine polmonare e d'origine cardio-circolatoria. Ricerca sperimentale eseguita col metodo di Knipping in soggetti affetti da silicosi e in cardiopazienti **[On Respiratory Insufficiency of Pulmonary and Cardiocirculatory Origin. Experimental Research carried out on Subjects affected with Silicosis and Heart Disease by the Knipping Method]** *Med d Lavoro* 1953, Aug.–Sept., v. 44, Nos 8/9, 329–82, 19 figs [Bibliography.]

The English summary appended to the paper is as follows —

"(1) Aim of the Authors is to examine thoroughly the knowledge of the mechanisms which cause respiratory insufficiency, and of the elements by which it is manifested and also the possibility of utilizing the latter for the evaluation of the functional conditions of the pulmonary apparatus, and of the cardiocircu-

... pping, ... it is ... our of ... iption, ... r, and ... t, both ... ied out ... ted by ... icosis),

and in 10 cardiopaths in functional compensation, during rest and work (on a walking ergometer).

"(3) The detailed description of the measuring apparatus, of the experimental process, and of the physio-pathologic mechanisms through which the respiratory insufficiency takes place in the three groups of subjects examined, is followed by a critical and differential investigation of the spirometric indexes by which it is manifested both at rest and under work

"(4) From the values obtained it results that in the sound subjects and in the pneumopaths, the respiratory insufficiency is due to the arising of an anoxic anoxia condition and is characterised by the following spirographic phenomena

"(a) Pulmonary hyperventilation, which is reduced after respiration of hyperoxygenised air (potential deficit);

[illegible]

light works is, of course, more often encountered in pneumopaths than in sound subjects

"(5) In cardiopathics respiratory insufficiency is referred to as stagnant anoxia, but it is clearly [illegible]

ventilation and the respiratory capacity, measured during rest immediately following work, decreases progressively with the intensity of the work"

SARTORELLI, E La prova della ventilazione polmonare massima nella silicosi [**The Maximum Breathing Capacity Test in Silicosis**] *Med d Lavoro* 1954, Apr, v 45, No 4, 232–8 [Numerous refs] English summary

In this paper the maximum breathing capacity is referred to by the initials VPM (*ventilazione polmonare massima*) and the vital capacity by the initials CV (*capacità vitale*) Both these values and the respiratory disability have been measured in 32 subjects whose ages varied from 32 to 70 years and who suffered from various degrees of silicosis Eleven of the cases are classified as being of the reticulo-micronodular type, 8 were discretely nodular, 7 were incipient confluent and 6 were mass confluent Sartorelli has used Tiffeneau's indirect method for measuring the VPM, which is the maximum volume of air which can be expired in 1 second (Tiffeneau's index) multiplied by 30 and expressed in cubic metres per minute; the subject is asked to breathe in as deeply and breathe out as quickly and as completely as possible and the result is recorded on a spirometer chart. Tiffeneau's index represents 80–85 per cent of the CV in normal subjects. VPM and CV were compared with the theoretical normal equivalents and any percentage reduction was determined for each subject.

Sartorelli measured the respiratory disability in each subject by Knipping's technique, expressing the results as a percentage of what is normal for a subject of comparable age. Knipping's method determines the intensity of effort at which an arterial anoxaemia appears; normal values range from 500 to 900 kgm./min Respiratory disability depends on alveolar permeability and gaseous exchange and reflects the condition of pulmonary function The VPM is related to the elasticity of the lung and is affected by pulmonary emphysema, whether this is primary or secondary to fibrosis

Among the 32 subjects, a good correlation with the respiratory disability was shown by the VPM in 25 (73 per cent) and with the CV in only 7 (22 per [illegible]

rapid means of assessing the state of the respiratory [illegible]

[illegible] alveolar permeability than in pulmonary ventilation.

J. Cauchi

SARTORELLI, E & GIORGI, Eleonora. Indagini sulla funzionalità respiratoria nei silicotici con l'ossimetria arteriosa durante il lavoro [**Investigations on the Breathing Capacity in Silicotics by means of Oximetry during Work**] *Med. d Lavoro* 1954, Nov., v 45, No 11, 600–607, 6 figs. English summary

The English summary appended to the paper is as follows —

"The behaviour of the blood oxygen saturation during work was studied by means of the 'Cyclops' oximeter, in 30 workers among whom were 6 normal and 14 silicotics The work consisted in walking the treadmill at a 10% slope, with gradual increase of speed up to the recording of the appearance of an arterial anoxaemia A blood oxygen unsaturation was noted in the 6 normal subjects during work-loads [illegible]

"Oximetry during work, as proved by the results obtained, is a method of undoubted practical utility

for the study of the respiratory function. Compared with other methods (Herbst-Margaria, Knipping), by which the behaviour of the blood oxygen saturation is studied only indirectly, oximetry during work in fact
pre
of
res
tol
are
mouth-piece or a mask"

SARTORELLI, E. & SBERTOLI, C. Il metodo di Knipping e l'ossimetria arteriosa durante il lavoro nello studio della funzione respiratoria dei silicotici. **[The Method of Knipping and the Arterial Oxymetry during Exercise in the Study of the Respiratory Function in Silicotics]** *Med. d. Lavoro.* 1955, Feb, v. 46, No. 2, 126–32, 1 fig

The English summary appended to the paper is as follows.—

"The essential datum to be established in the evaluation of the respiratory function is the intensity of exercise at which an arterial anoxemia appears. This can be evidenced both by direct methods (arterial oxymetry 'in vivo') and by indirect methods (study of the O_2 deficit according to Knipping)

"The two methods were used for comparative experiments in 5 normal subjects and in 35 silicotics to establish whether the methods furnish, according to what is theoretically foreseen, conforming results in the study of the respiratory function

"The exercises consisted in walks on a treadmill at a 10% constant slope and speed varying from 0 5 and 8 Km/h, the intensity of exercise was calculated in Kgm/min. Each subject was at first examined for the intensity of exercise giving way to a clear O_2 deficit according to Knipping, determinating spirographically the O_2 consumption both during breathing atmospheric air and during breathing of air containing 50% of O_2 By means of measurement 'in vivo' with the 'Cyclops' oxymeter, the subjects were then examined for the intensity of exercise producing the appearance of an evident O_2 unsaturation of the arterial blood

"The research showed that the results obtained were conforming for both the methods in 29 subjects out of 40, in the other subjects divergencies were as low as 15%.

"Compared with the method of Knipping the arterial oxymetry offers the advantages of greater rapidity of the tests and of being better tolerated by the patients; at times, however, it presents troubles of technical nature which render difficult its application.

"At present therefore the authors utilize the arterial oxymetry as a routine method for the study of the respiratory function in silicotics, the method of Knipping being used for cases in which the oxymetric method is difficult to apply or when data on the behaviour of the respiratory function during exercise that can be furnished only by spiroergometry are desired."

PARMEGGIANI, L. Sulla capacità vitale dei

A total of 424 cases have been studied by taking the highest of 3 to 8 spirometer readings made in the morning with the patient standing The full co-operation of the patient is essential in this type of research, the subjects were chosen mainly from patients of the "Clinica del Lavoro" of Milan University, omitting any whose full co-operation was in doubt

Of the 424 cases of silicosis, 78 were at the fibrous reticular stage, 189 had advanced to a nodular distribution, in 92 the distribution had become "confluent" or massive, and the remaining 65 had developed tuberculosis. These types represent the successive stages of the disease as demonstrated by clinical and X-ray examination. The spirometer readings gave an average vital capacity of 3,327, 3,216, 2,880 and 2,884 cc., respectively, for the 4 groups and this disposes of the old fallacy that a diagnosis of silicosis could be excluded when the ... of over 3,000 cc.

tuberculosis has supervened.

But certain other factors besides disease, *e.g.*, body weight, height, chest measurement, body surface area, age, sex, race, etc, have a bearing on the direct spirometer readings and various formulae have been devised from time to time to reduce such readings to a comparable standard or "respiratory index". The formula devised by PIOLTI seems to be most applicable to the people of Northern Italy for working out their individual "theoretically normal" vital capacity.

Using the formula $\frac{\text{direct spirometer reading}}{\text{theoretical normal}} \times 100$
... reticular cases,
... and 72
... sis. Or,
... reticular
type of disease is taken as 100, this ratio is reduced to 98 when the changes have developed to the nodular stage, 93 at the "confluent" stage and 89 when tuberculosis has supervened: the vital capacity, therefore, suffers its heaviest reduction when nodular has become massive infiltration Emphysematous changes, too, are most marked at this stage of

development of the disease and they are believed to be particularly responsible for the reduction in vital capacity. Of the 424 cases, 313 had little or no sign of emphysema, 80 had a moderate degree and the remaining 31 showed severe emphysema The direct (uncorrected) spirometer readings for these 3 groups were 3,219, 2,927 and 2,458 cc, respectively, equivalent to a ratio of 100, 90 and 76 Expressed as percentage ratios between direct spirometer readings and theoretically normal vital capacity $\left(\frac{\text{direct spirometer reading}}{\text{theoretical normal}} \times 100\right)$ we get a value of 80 for cases with little or no emphysema, 73 for moderate and 64 for severe emphysema i e, moderate emphysema reduces the ratio by 9 per cent. (taking the ratio for non-emphysematous cases as 100) and severe emphysema by a further 11 per cent The reduction of vital capacity in silicosis, therefore, is dependent on the degree of emphysema more than on the severity of the fibrosis

J. Cauchi

PARMEGGIANI, L. Sulla capacità vitale dei silicotici

The Theoretical Vital Capacity is an important functional test which is based on anatomical factors and it is to be preferred to effort tests which may be affected by factors other than changes in the lungs In silicosis, changes in vital capacity accompany the very earliest anatomical changes and precede any subjective symptoms Reductions in vital capacity follow the development of emphysematous changes even more than the development of fibrosis

After a critical review of several formulae which have been suggested for working out the theoretically normal vital capacity of any one individual, Parmeggiani hopes that some more exact formula will be yet evolved which will make it possible more exactly to assess the functional damage sustained by a worker contracting silicosis It is difficult correctly to make such an assessment unless it is possible to know what the normal vital capacity of a particular individual theoretically was before silicosis supervened

J. Cauchi

Parmeggiani has examined the ratio between the frequencies of pulse and respiration in 398 cases of silicosis by the method which has been in use for some years at the Milan Institute for Research in Occupational Disease In this test, the subject is made to run up 60 steps, each riser being 18 cm, giving a total vertical climb of 10 80 metres · the time taken by the test varies from 20 to 50 seconds according to body-build and other individual characteristics In the case of weak subjects, the stair-climbing is replaced by bending down at the knees 10 to 20 times in 20 to 40 seconds Pulse and respiration rates and arterial blood pressure are measured at rest and also immediately after the effort and thence at intervals of 1 or 2 minutes until the subject has recovered from any

cyanosis if present. Parmeggiani recognizes that the results of such tests may be prejudiced through intentional or emotional factors on the part of the subject and that this is a handicap if the test is being carried out for purposes of compensation or other medico-legal assessment.

Of the 398 cases of silicosis which were tested, 73 belonged to the reticular type, 180 to the fibro-

increased frequency after effort, whereas respiration had a faster rate when at rest. The cardio-respiratory coefficient (CRC) in these cases of silicosis was found

2 to 2 9

Parmeggiani concludes that individual variations

must be closely watched if useful conclusions are to be arrived at In the more serious cases, the time taken for recovery of pulse and respiration rates which have been disturbed by effort may give useful information for assessment purposes

J Cauchi

PARMEGGIANI, L. & PINEROLO, A Le modificazioni della potenza respiratoria nei silicotici [**Respiratory Capacity in Silicosis**] *Med d Lavoro* 1950, Aug-Sept, v 41, Nos. 8/9 237-42 English summary

Using a metal tube 10 cm. long and 1 mm in diameter as a resistance in a Benedict spirometer,

and a forced expiration The scientific reasons for the experiment were fully explained to each individual and the tests were made on subjects whose co-operation could be relied on The maximum measurements out of 3 separate tests were selected in each case.

The 14 normal subjects, who belonged to the same age-groups as the persons with silicosis studied, gave average readings of 900 cc for expiration and 700 cc. for inspiration

Of the 32 cases of silicosis, 10 were at the reticular fibrotic stage, 8 were of a nodular type, 6 had mass infiltration, and 7 had developed tuberculosis. Most of them gave measurements below those of the …

… for 2 minutes) lowered, and iludrine (0 5 per cent. for 1 minute) raised, the readings at inspiration but … aerosols did not seem ap- …

… caused by emphysema, and these processes set in at an early stage in silicosis The variations found in inspiratory capacity suggested no correlations with the degree or stage of silicosis reached by each case This function was shown to react to bronchodynamic aerosols and its variations are due to bronchial spasm. Spirometer readings taken at rest do not reflect the full action of tuberculous toxaemia on the respiratory capacity *J Cauchi*

HANAUT, A , RUYSSEN, L. & CARA, M. Évolution de la capacité vitale et de la ventilation maxima … Étude … ution of … ntilation … osis. A … Malad … No 2,

Over a year ago a spirographic service was installed at Merlebach where the study of the respiratory function in silicotics has been developed, and has become a part of the routine examination in connexion with the prevention and compensation of silicosis The present study concerns 570 coal miners, between the ages of 17 and 60 years, of whom 452 were examined at the Merlebach Centre , of these radiographic examination showed 398 normal, and 54 slightly affected by silicosis, but without respiratory symptoms , included with these are 118 men, in various stages of silicosis, who had been specially examined by M. GUILLET for the purpose of a thesis (*Thèse de Nancy*, 9 July, 1951). The apparatus was a spirograph of proved accuracy.

The relative value and practicability of the direct and indirect methods of determining the maximum …

… examined ; the results obtained are generally misleading. It appeared necessary, therefore, to adopt the indirect methods which are better suited to practical medicine. The findings, and the discussion …

They also examined the variation of the maximum ventilation obtained by direct measurement; this variation was less clear, and much more subject to … the variable amount of co-operation …

… work the results show that the incapacity corresponding to change of employment (4 per cent) would appear at a mean of 55 years of age, with the limits of probable variation between 48 and 62 years ; the part played by obesity is also discussed.

E. L. Middleton

AUGIER, MATTEI, PERRET & MAULINI La mesure de la vitesse de circulation et la mesure de la pression veineuse dans l'examen des pneumoconiotiques **[Measurement of the Rapidity of the Circulation and of the Venous Pressure when Examining Pneumoconiotics]** *Rev Méd Minière*. Douai. 1950, v. 3, Nos. 9/10, 41–3.

In any case of silicosis the efficiency of the cardiovascular system is of importance, since it may be … circulation … ork has … normal … rt have … s instru- … Two … ment is not well suited … other methods of observation are proposed which are simpler to use ; the rapidity of the circulation and venous pressure The rapidity of the circulation is measured by noting the time taken before taste is detected after some substance has been injected into a vein at the bend of the elbow. After trying out

[illegible]

of the pulmonary circulation may be measured by injecting ether (0 3 gr., in 3 cc. saline), the taste of which is detected when it reaches the pulmonary alveoli; here average times vary from 4 to 8 seconds. A combined injection containing both these substances [illegible]

[illegible]

water indicates cardiac stress. A further communication on the subject is promised.

E. L. Collis

PARMEGGIANI, L. Importanza della determinazione [illegible]

In 59 selected cases of silicosis, the injection of 0 3 cc. of ether has been used to measure the *time* taken by the pulmonary artery cycle The total pulmonary circulation has been measured by the injection of 3 cc of sodium dehydrocholate in 20 per cent. solution Some of the factors—*e g*, sharpness of the sense of taste, which may react quicker to a sweet than to a bitter flavour—which may affect the readings of such tests are referred to All the subjects examined were hospital in-patients and the importance of selecting the environment and the individuals when making such measurements is stressed

The results are tabulated, distinguishing the 4 usual silicotic groups of reticulation, nodulation, massive shadows and silico-tuberculosis It is concluded that in some cases of silicosis these measurements are useful in assessing the course which the disease is taking

The venous blood pressure was measured in 14 cases of silicosis, by the method of ALESTRA and RUFFINI There were 4 cases each of nodulation and of massive shadows, and 3 each of reticulation and of silico-tuberculosis. It is concluded that no useful light is thrown by this method on the functional condition in silicosis

J. Cauchi

ZORN, O. Vergleichende elektrokardiographische [illegible] Silikosen. [illegible] and X-Ray [illegible] *Silikose-* [illegible] (28 refs.)

[illegible]

There is, however, good reason to suppose that emphysema (either that produced by pneumoconiosis [illegible]

produced by actual interference of the blood flow through the lungs by fibrosis. In cases where there is compensatory hypertrophy of the left ventricle [illegible]

In the second part of the paper the author describes his attempts to distinguish between functional disturbances of balance between right and left ventricles and actual changes in the heart musculature.

He does this partly by examination of electrocardio- ... (using a unipolar lead) and partly by

may be the result of atrophy of the muscle of the left ventricle, but owing to the existence of numerous other factors, which are liable to produce changes in electrical potential, it is not possible to judge the ... of the heart beat by the size of the deflections

of the left ventricle.

The author's final conclusion is that an electrocardiograph may be of considerable help in assessing the clinical condition of a patient suffering from pneumoconiosis, but must always be read in conjunction with other methods of examination.

Alice M. Stewart

CERESA, C & FEDELE, F. Considerazioni sul comportamento ... elettrocardiogramma nella silicosi polmon... **Pulmonary S...** Jan, v. 45, ... summary.

The authors have studied the electrocardiogram in 204 cases of silicosis The stage of silicosis does not seem to affect the position of the heart, but the

will demonstrate progression to hypertrophy of the right side "The delay of intrinsic deflection in the right precordials and the negative deviation of the T wave in the right precordials to the left of V1, are sure signs of myocardial impairment in a silicotic person."

Charles Wilcocks

FOUBERT, P. & DUBRULLE, P. Étude électrocardiographique du test d'hyperpression expiratoire contrôlée (H E C.) chez les silicosés [**Electrocardiographic Study of the Test of Increased Pressure in Controlled Expiration in Silicotics**] *Rev Méd Minière*. Douai 1954, v. 7, No 25, 32–6, 8 figs. on 4 pls

The test discussed here was that recently described by CÉLICE *et al.* (*Presse Médicale*, 1952, v 60, 1037) as a method of studying the electrocardiographic deflection P in subjects suffering from chronic pulmonary disease, with the aim of tracing early signs of impairment of the heart which might not be detected by the usual methods. The patient, in the dorsal recumbent position, exhaled through a rubber tube connected with a U tube containing mercury, until the pressure level indicated on a manometer reached 40 mm., and maintained it at that level as long as possible At the same time an electrocardiogram was recorded for 1 minute, which included the time of the test, and this was compared with a tracing taken before the test. In normal subjects there was generally an increase in the amplitude of deflection P of 50-100 per cent. and sometimes it assumed the pointed shape of pulmonary P. Less often small alterations occurred in the complex QRS or the deflection T. All these alterations disappeared when the increased respiratory pressure ceased. It had been claimed that the modifications of deflection P persisting beyond 10 seconds should make one suspect, if not affirm, the existence of right ventricular impairment, even in the absence of clinical, radiological and electrocardiographic signs.

The authors of this article have applied this test to 30 silicotics with well marked disease They found the procedure easy and the patients maintained the pressure for 10 seconds or more In general deflection P was found to be increased in amplitude during the maintained pressure; in all patients in whom the right heart was found apparently normal by clinical, radiological and electrocardiographic examination the test was negative, the modifications of deflection P having disappeared at the end of 10 seconds Analysis of certain special cases led the authors to conclusions different from those of Célice In 1 case in which the raised pressure was maintained for 7 seconds at 30 mm. no modification of deflection P was recorded, but the deflection T was inverted and the tracing took the aspect of one of overload and the test appeared to reveal a latent overload of the right heart In 2 other cases where all the usual signs indicated chronic cor pulmonale the test was negative, the increase of deflection P having returned to normal 15 seconds after pressure was released A certain variability was noted in other cases which are described. In 1 case the increase of deflection P disappeared after 10 seconds and reappeared 1 minute after the test

As a result of this study it seemed that the value of the test of raised pressure in controlled expiration was debatable In the special conditions associated with silicosis the study of deflection P would not enable certain difficult problems to be resolved, especially in those cases where one hesitated to say whether the anomalies of the electrocardiogram were connected with an altered position of the heart or with its hypertrophy.

Illustrations show electrocardiographic tracings from 8 patients, taken before, during and after the test

E. L Middleton

DUBRULLE, P. & CLAEYS, C. Place et intérêt de la rhéocardiographie dans l'étude du coeur des silicosés. [**Rheocardiography in the Study of the Heart in Silicotics**] *Rev Méd Minière* Douai. 1954, v. 7, No. 25, 37–40, 2 text figs & 6 figs. on 3 pls.

from the ventricles Rheocardiography is carried out by means of an apparatus comprising a battery providing a Wheatstone bridge with an alternating current under 15 volts at 20 kilocycles, the patient

served as a means of timing the phases simultaneously. The electrodes used were applied either over the right scapula and on the left leg, or over the right scapula and the front of the chest, the former was found preferable Comparison of the curves taken by the electrocardiograph and the rheocardiograph in the normal subject is discussed, and

definite diminution in the duration of expulsion of blood from the ventricles accompanied by a marked increase in the duration of ventricular contraction It was difficult to ascribe modifications in the amplitude of the curves to their causes It is claimed that rheocardiography has a place in the examination of silicotic

injury

could be discovered for use in the routine examination of the heart in silicotics

An instructive figure representing curves taken simultaneously for comparison of the electrocardiogram, rheocardiogram and phonocardiogram is included *E L Middleton*

RAULE, A., BRINA, A & GRISLER, R Rilievi e considerazioni sul risentimento cardiovascolare nella silicosi **[Studies and Considerations on the Cardiovascular Behaviour in Silicosis]** *Med d Lavoro* 1953, Oct., v 44, No 10, 416–19 [25 refs.]

The English summary appended to the paper is as follows —

"In 80 silicotics and in 34 persons affected with silicosis combined with open and active tuberculosis, the cardiovascular function has been studied by means of radiologic and electro-cardiographic investigations, and by means of circulatory function tests; cardiac involvement was found in 3 75% of the silicotics, and 29 41% of the silico-tuberculotics

"The rare myocardiac involvement in course of silicosis not complicated by tuberculosis is in contrast with the frequency of a vascular hypotony (chronic circulatory collapse), this hemodynamic situation is almost exclusively duo to peripheral factors, because only in very few cases it can be ascribed to myocardial damage"

LORI

The cardiovascular efficiency of 60 silicotic miners was carefully studied A clinical examination was made in which heart sounds and rhythm were noted;

normal Blood pressure was nearly always low, especially in the presence of emphysema or malnutrition, but it was found high among miners away from work, although it was almost always low when the miners were underground. The rapidity of the circulation was normal in 46 cases; slowed in 4, and quickened in 5, all associated with pronounced emphysema Venous pressure was very low in 22 instances, low in 25, and above average in 7 No gross

tubular heart in which the appearance is that of a more or less perfect tube There may be torsion of the heart. Cardiovascular efficiency was not found closely correlated with the silicotic state Nevertheless slowed circulatory rapidity pointed to circulatory insufficiency. High venous pressure also was an indication of heart failure, especially if combined with slowing of the circulation.

E. L. Collis

PORTO, J. Silicose et "cor pulmonale" chronique. **[Silicosis and Chronic "Cor Pulmonale"]** *Gaz. Méd Portuguesa* 1951, v 4, No 1, 47–58, 6 figs [14 refs] English summary.

A study of silicosis of nodular type, but not including the pseudo-tumoral type, and especially of the heart and circulation, led the author to the general conclusion that cyanosis and polycythaemia are rare or even exceptional in that condition, and that death is due either to tuberculosis or to the progressive reduction of available alveolar space, and not to heart disease

The silicosis which formed the basis of this study was contracted in the Portuguese mines of Urgeiriça and Serra da Lousã where the extraction of uranium, pitchblende and lead was carried on in rocks where silica was present in the form of granites. All the cases examined were in the advanced stage. The symptoms and physical signs had no special characters ; cyanosis was found in only two or three cases among several hundreds examined, and engorgement of the veins of the neck was not seen The vital capacity was diminished ; in ten selected cases the values found ranged from 32 to 94 per cent. of the normal ; measurement of the heart showed that the dimensions were normal ; electrocardiographic examination showed no change in the myocardium or any lesion of the heart Tests of effort, venous tension, time of circulation, minute volume and haematocrit value led to the conclusion that cardiac insufficiency was slight or practically absent in silicosis of nodular type ; there was, however, a certain degree of hypertrophy of the right ventricle, and the reserve force was seriously reduced. Complete post-mortem examinations, made by Professor G Brites on two of the author's cases, showed costal and diaphragmatic adhesions , pleuro-pericardial adhesions ; increased density and diminished elasticity of the lungs , emphysema and numerous discrete nodules with collagenous fibrous centres and a tendency to form aggregates Arterioles and venules showed progressive hyperplastic fibrosis leading to obliteration , a similar destruction of the bronchioles, commencing in the mucosa, was seen

It can be concluded that there are ample reserves in the pulmonary arteriolar system and a capacity for adaptation of this circulation , the extensive

heart disease as a cause of death in the nodular form of silicosis the author has not found this to be the case, and even in the most advanced stages he found only unimportant cases of *cor pulmonale.*

E. L. Middleton

Samuelsson, S **Chronic Cor Pulmonale in Silicosis.** *Acta Med Scandinavica* 1952, v 142, Suppl 266, 875–85, 2 figs [23 refs]

" The writer's material comprises 83 cases of silicosis They were borrowed from the Danish Directorate of Accident Insurance, and derived from the period 1933–1945 Of them 23 were alive and 60 dead Only advanced cases of living patients were selected Of them 69 per cent. showed radiological

symptom by far, was diagnosed exclusively in the right oblique view in 75 per cent of the cases who failed to exhibit this sign in the routine antero posterior view. Only one case showed electrocardiographic signs of right heart strain The average time of exposure was 16·7 years

" Among the 60 deceased patients, 53 per cent had exhibited signs of cor pulmonale Half the patients had been autopsied, and 50 per cent had been found to suffer from cor pulmonale When classified by occupation, the porcelain workers were most commonly affected, but the sand blowers had the highest incidence of cor pulmonale and by far the shortest average exposure time

" Electrocardiograms had been taken in 28 cases, 10 (35 per cent) of whom showed signs of right cardiac strain. X-ray films of the chest were available for 33 patients, where signs of strain of the right heart could be found in 15 cases (45 per cent) Silico-tuberculosis were found in 17 cases (28 per cent), being the direct cause of death in three cases The most frequent causes of death were · Bronchopneumonia and pneumonia in 18 (30 per cent), definite heart failure in 13 (21 per cent) "

Hasselt · Institut d'Hygiène des Mines Communication hors-série. Le coeur pulmonaire chronique dans la silicose (Lavenne, F) **[Chronic Cor Pulmonale in Silicosis]** 1952, 11 pp [Reprinted from *La France Médicale* 1952, Feb , No 2]

A review of the subject

Rossier, P H., Buhlmann, A. & Luchsinger, P. Cor pulmonale und Silikose **[Cor Pulmonale and Silicosis]** *Arch f. Gewerbepath. u Gewerbehyg* 1955, v. 13, No. 5, 486–95. [Numerous refs]

The pneumoconioses, and especially silicosis, may lead to overload of the right heart and finally to primary right-heart failure Cardiac failure as a cause of death in silicosis is second only to tuberculosis in frequency The hypertrophy of the right ... with findings ... iography and satisfactory ... ion between ... ows the pro- ... ed from the functional aspect. The authors found by their investigations that impairment of pulmonary function could not always be proved, and only by a comparison of the radiological stage in a large number of cases was a certain parallel shown to exist between the amount of radiographic change and the impairment of pulmonary function A clearer understanding was obtained

when the impairment of function and the mechanism of pulmonary tonus were exactly defined, this was made possible with the use of the heart catheter in testing pulmonary function in rest and during effort

Lowering of the alveolar oxygen tension or raising of the carbon dioxide tension leads to a narrowing of the arterioles in the pulmonary circulation and with it to increase of pressure. ROSSIER described global insufficiency (*Globalinsuffizienz*) of the lung, characterized by general alveolar hypoventilation with corresponding changes in the gaseous tensions and arterial hypoxaemia and hypercapnia. Global insufficiency is found in many forms of chronic pulmonary disease, including silicosis with related bronchitis and emphysema All the 50 cases of global insufficiency investigated with the heart catheter showed *pulmonary hypertonus*, this could be reduced

[illegible]

cor pulmonale and the associated impairment of function.

The second important cause of cor pulmonale is the reduced capillary stream, brought about by all the processes which caused loss of lung parenchyma and led to hypertonus with raised capillary resistance Studies on patients after pneumonectomy have shown that loss of the capillary bed must reach about two-thirds of the total before pulmonary hypertonus occurs during rest It is a quantitative question, whether the capillary loss is so great that even in rest lung

[illegible]

tion is also a cause of cor pulmonale as well as reduced capillary flow Impairment of function is not always parallel with the extent of silicotic changes, but alterations in the parenchyma and loss of elasticity due to age play a part

It is important to see with what certainty the electrocardiogram indicates overload of the right heart In 49 cases of cor pulmonale the electrocardiogram, with the usual *standard leads*, indicated only 22 cases, that is 45 per cent, and in the other cases either a high probability or no tendency at all to overload; by using right and left sternal leads there was no substantial difference from this figure, with the vectorcardiogram a few patients with negative

[illegible] right [illegible] gical [illegible] de of [illegible] was [illegible] ale is [illegible] nary

hypertonus in global insufficiency is the result of functional narrowing of arterioles by alveolar hypo-

[illegible]

influenced by therapeutic measures since the cause is an anatomical change, in these cases administration of oxygen and protection from physical effort may bring subjective improvement but substantial relief of the right heart is not possible Without treatment the prognosis in both types of cor pulmonale is the same

Investigations on 335 patients with silicosis showed a certain parallel between the severity of the silicosis and the frequency of cor pulmonale. The percentage incidence of cor pulmonale was stage III, 33 per cent , stage II, 16 per cent , stage I, 5 per cent In the progressive cases the cor pulmonale was chiefly the result of reduced capillary surface which led to diffusion impairment, whereas in the early cases the chief cause was the result of global insufficiency.

E L Middleton

REICHMANN, V. Modificazioni del cuore destro e del circolo polmonare nei silicotici e nei silico tubercolotici **[Alterations in the Right Heart and Pulmonary Circulation in Silicosis and Silicotuberculosis]** *Med d Lavoro* 1952, Feb., v 43, No 2, 61-5 English summary

The English summary appended to the paper is as follows :—

" The problems of the right heart in cases of silicosis and silicotuberculosis are reviewed and an opinion is

[illegible]

In one case of emphysema and under conditions of

[illegible]

compared with the normal; in the veins greatly retarded discharge and hence better visualisation of the pulmonary vessels in silicosis as compared with ... The slowing down of the circulation ... erious silicosis ... ive filling it is ... o *pulmonary* ... nodular peri- ... catheter it is possible to measure the speed of the pulsation wave in the pulmonary artery."

DUBRULLE, P., NADIRAS, P., BALGAIRIES, E., DELESVAUX, R. & CLAEYS, C. Le Syndrome de souffrance ventriculaire droite chez les silicosés. **[The Syndrome of Impairment of the Right Ventricle in Silicotics]** *Rev Méd Minière.* Douai. 1954, v. 7, No. 25, 27-31, numerous figs on 16 pls

Injury to the cavities of the right heart is not uncommon in silicotics and the name "chronic cor pulmonale" has been used to designate it. Examination of silicotics has led the authors to adopt the above general title by analogy with the terminology proposed by DONZELOT in the congenital lesions

The usual clinical, radiological and electrocardiographic examinations were made and were followed by vectorcardiography, rheocardiography, oxymetry, measurement of the venous pressure and of the residual air Of 52 patients examined over several years 31 died, of whom 15 came to autopsy, and 21 were living at the time of this publication. Clinical examination showed right global asystole, sometimes with anasarca, in 18 cases, and right *bruit de galop* in 2 cases only. In the radiological examination of silicotics precise measurement of the cardiac diameters is of doubtful value owing to displacement by adhesions, emphysema, etc. Two points appear to be important. first, the curve of the right border which may be obscured by the silicotic lesions, and here tomography may help; increased prominence of this curve indicates overload of the right pulmonary artery. The second point to note is the general aspect of the heart, this may be altered as the result of the lesions in the lungs. Overload of the right heart, with enlargement, connotes a grave prognosis. In this series 3 out of 4 patients with enlarged heart died in global asystole, and of those with normal or apparently small heart shadows 1 out of 10 died in asystole, of the survivors 8 were with enlarged heart (4 with asystole), 15 were with normal heart and only 1 of them with asystole Thus radiographic examination appears to show that the cardiovascular shadow may be normal even with overload of the right heart, prominence of the pulmonary artery is a sign of danger and enlarged heart indicates a bad prognosis All the cases in this series had massive pulmonary lesions and emphysema, and there was no correlation between the radiological appearances of the lungs and the clinical form of the overload of the right ventricle

In discussing evolution and prognosis the authors show that there are 2 entities in silicotics with impairment of the right ventricle. In one the impairment is not accompanied by asystole or enlarged heart and is purely of electric type (23 cases) shown in most cases by predominance of the precordial S deflection (18 cases), as the authors have been able to verify in several cases shortly before death The second entity is that in which the classical type of asystole occurs with enlarged heart and a pathological electrocardiogram. Besides these 2 forms the authors found 9 patients with enlarged heart without asystole at first, but of these 2 later developed anasarca, the type of electrocardiogram being changed. In 2 observations asystole was accompanied by a heart radiologically normal or apparently small One may see the passage from one type of electrocardiogram to another type, but the direction of this passage is not always the same and it is impossible to attribute a particular prognosis to a given electrical form A silicotic subject with signs of impairment of the right ventricle may die with a heart reasonably normal radiologically and without asystole, or he may die with enlarged heart without asystole, but in most cases asystole is present; it is quite exceptional for a patient with asystole and an electrocardiogram indicating impairment of the right ventricle to die with a small heart. Asystole has appeared 2 to 24 months before death, sometimes as a single terminal event, sometimes with several remissions Electrocardiographic signs of hypertrophy of the right ventricle may precede death by at least 3 years, and the appearance of asystole, eventually, by 1 year It would seem, therefore, that in the great majority of cases the first entity may be but the beginning of the second, and that death might occur before the development of the purely cardiac condition had had time to be completed ... of chest radiographs ... nezograms or ... re is also ... *Middleton*

BOEMKE, F, PIROTH, M & SCHULTE-STRACKE, F J Silikose und Coronarsklerose. **[Silicosis and Coronary Sclerosis]** *Beiträge z Silikose-Forschung* 1955, No 33, 1-29, 4 figs [20 refs]

In this study the authors examine the relationship between silicosis and its effects on the heart and circulation, and discuss the problem of deciding whether, in persons who have both silicosis and severe coronary sclerosis, death is exclusively the result of the injury caused to the heart muscle by arteriosclerosis or whether the presence of silicosis has some connexion with it The damage to the circulation by the silicotic process in the lungs has frequently resulted in hypertrophy of the right heart, and this

may be a factor in the development or extension of a coronary sclerosis If such a supposition is accepted it may be expected that other diseases, besides silicosis, which have a similar reaction on the heart muscle, may favour the development of coronary sclerosis

To find answers to these questions the reports of a large number of autopsies were examined Excluding unsuitable or imperfect records 12,695 remained for

chronic overload of the right heart (chronic emphysema, bronchitis, and deformities of the thorax), 1,389, (4) diseases with evidence of only moderate overload of the right heart (tuberculosis and cancer of lung), 3,364; (5) diseases with overload of the left heart and the whole heart, 569 Two age-groups were used under 50, and over 50 Owing to the nature of the institutions in which the autopsies were made there was a high proportion of males and the incidence of silicosis was considerable

Each of the 5 pathological classes is analysed in

details As an example the chief points in the first group, that is the severe silicosis group, may be mentioned The total number included 1,412 under 50, and 1,905 over 50 years of age, of the younger group 740 had slight, and 145 had severe coronary sclerosis, in the older group 1,064 had slight, and 326 had severe coronary sclerosis, in all, the younger group had 885 (62 7 per cent) of coronary sclerosis, compared with 1,390 (73 0 per cent) in the older

the age-groups over 50 the corresponding percentages were. (2) 81 8, (3) 75 0, (4) 71 1, (5) 84 1

The analyses are discussed and the importance of

existing coronary sclerosis, is to be expected with certainty These investigations have confirmed the already known fact that various endogenous and exogenous factors are of importance in the formation and extension of coronary sclerosis Among exogenous factors are chronic diseases of the lungs, including silicotic processes, in so far as they react on the coronary system through injury to the pulmonary circulation It was not possible, from the results of the investigation, to indicate which disease was the more important as the cause of death where severe silicosis and severe coronary sclerosis were both present

E L Middleton

SALVINI, M. Blocco di branca e compromissione

no. 2, 114-20 [12 refs]

The English summary appended to the paper is as follows —

"654 subjects have been observed and studied under

silicosis

cannot be considered as a specimen not having been

circulation

"With the aid of the above mentioned data, the Author comes to the conclusion that in silicosis

VERSTER, A. S. W. **The Radiological Diagnosis of Silicosis.** *Proc. Transvaal Mine Med. Officers' Ass* 1950, Sept., v 30, No. 323, 57–66, 13 figs.

The author, who is Chairman of the South African Silicosis Medical Bureau, gives an account of the present standards of diagnosis and differential diagnosis of silicosis as it occurs among miners of the Witwatersrand

tube is firmly fixed, and a double focus rotating anode tube immersed in oil in a shock-proof X-ray casing and connected by cables to a high voltage transformer unit. The best results are obtained with a focal spot of 2 m m. square, the filament of which requires 3 5 to 5 7 amperes and 4·5 to 12 volts. An impulse

ampere tube unit with a maximum voltage of 90 K.V.P. The average exposure at the bureau is 40–60 K.V P. For purposes of identification each film is numbered by placing it over a perforated copper stencil and giving an exposure of a few milliampere seconds."

Silicosis as met with in the Witwatersrand cannot be classified as a disabling disease, it is only with the onset of emphysema and definite clinical bronchitis, which is always found associated with silicosis, that disability becomes apparent. The Bureau estimates disability mainly on observation at periodical

A description is given of the development of silicosis, as seen by X-ray examination [Unfortunately the quality of the published reproductions detracts from their value.] The earliest stage is shown by increased linear markings until, eventually, generalized arborization is reached; about half of such cases show the presence of small nodules *post mortem*. When nodules become apparent in the radiograph the linear marking seems to disappear, probably because fine emphysema develops and obscures the fibrosis Generalized arborization is not seen in the rapidly developing signs in welders, iron ore and tin workers, or associated with cardiac conditions.

The term "partly infective" used with X-ray signs is now used to denote even more marked exaggeration and diffuseness of linear markings, increased density of hilar shadows, and sometimes areas of diffuse haziness; irregularity in shape, size and distribution of nodules with a tendency to aggregate.

When the stage of generalized arborization has been reached X-ray films may show progression, whether the individual leaves the dusty occupation or not. In South Africa the average time for a European to develop silicosis is about 22 years, and for an African about 11 years, the latter is much more liable to develop tuberculosis.

Differential diagnosis is made from the following

may eventually develop. Tuberculo-silicosis (infective silicosis) is differentiated from anthraco-silicosis, tuberculosis, actinomycosis, fungoid infections,

E. L. Middleton

ZORN, O. Kritische Betrachtungen zur Rontgentechnik bei Silikosen [**Critical Observations on X-Ray Technique in Silicosis**] *Beiträge z. Silikose-Forschung.* 1953, No 21, 1–33, 19 figs. [12 refs]

He finds much benefit from the use of very [illegible] tubes, with an optimal aperture of 0 3 mm., giving a punctiform light source With "hard" X-rays (110–125 K V.) the exposure time can be shortened to 0 06–0 1 second, thus reducing fogginess due to movement of the lungs and pulsation of the lung arteries.

The most important application of the fine focus tube is in enlarged radiographs; the film is placed 50 cm from the mid-line of the patient's body, which itself is 50 cm. from the focus; the picture is therefore much enlarged. The enlargement is calculated—

$$V = \frac{\text{Focus film distance}}{\text{Focus object distance}}$$

To obtain a picture as non-granular as possible the author finds the Adox-Film 5515 type 70 most suitable, it gives smoothness, clarity and gradation and is long-lasting Illustrations of suitable apparatus built to the author's requirements by the firm of Siemens-Reiniger show the tube-holder set to maintain a constant distance between patient (mid-line) and focus of 50 cm; the distance between patient and plate can be varied by forward or backward movement of the screen and special parts of the lung can be fluoroscoped without special montage

Illustrations of lung radiographs show the comparative results in sharpness of structure detail, with various procedures

The special advantage of the fine focus tube is the sharp contrast and smooth picture which it produces It enables a distinction to be made between miliary tuberculosis and early silicosis, the reticulosis due to thickening of interlobar septa being much finer in the latter, while the rapid variability of nodule formation, a distinctive diagnostic feature of tuberculosis, is well shown When used with the enlargement technique it also shows the finest nodules and

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The paper describes and discusses advances in X-ray

an enlargement of 1 1 5 is obtained

This technique is specially useful in combination with newly developed X-ray tubes which have 0 3 mm focal size These tubes reveal clearly morphological detail of 0 3 to 1 5 mm size and such detail is specially important for recognizing early silicotic lesions However, the tubes require 6- to 7-fold exposure times in order not to be overloaded and it is suggested that a 0·6 mm focus tube might be more advantageous

In order to make X-ray examination a functional test it is necessary to take X-rays at predetermined phases of the heart beat In conjunction with a German firm (C H F Muller) the author has

to take 4 successive exposures of size 10 × 15 cm (4" × 6") in less than one second with the equipment and to have the exposure intervals recorded on the ECG

SHIELS, D O & THOMAS, D L G **Comparison of Different Types of X-Ray Films for Case Finding and Diagnosis of Silicosis,** *Med J Australia* 1954, Feb 6, v 1, No 6, 200–204, 4 figs

The purpose of this study was to see if miniature films could be used for preliminary silicosis case-finding, 21 men with normal or doubtfully normal chests and 46 to 51 cases of pneumoconiosis with or without tuberculosis, all of whom had previously been picked up by miniature mass radiography, were radiographed by 35 and 70 mm miniature and by full size films by the conventional and by the non-screen technique All the sets of films were read indepen-

observers

with a very slight trend in favour of the non-screen films In relation to the diagnosis of "Definite or suspected silicosis or other abnormality suggesting need for further radiological examination in regard to pneumokoniosis" one observer got 98 per cent correct with the 35 mm films and 94 per cent correct with the large films The average percentage correct was 78 with the 35 mm, 83 with the 70 mm, 91 with the large, screened, and 92 with the large, unscreened films. The lowest percentages correct were respectively 54, 67, 78 and 86 Figures are also given for the numbers of films in which given degrees of unanimity were achieved, which show a similar trend towards better agreement with the large films

The authors conclude that with certain observers the 35 mm and 70 mm films may be very useful in X-ray surveys for silicosis case-finding

[No details are given of the severity of the cases of silicosis but since they had all originally been picked up by miniature mass radiography it is not surprising that most of them were diagnosed in this trial The authors in fact argue that since advanced cases will be detected by any radiographic technique and in the absence of advanced cases there can be no serious hazard any technique will do for screening If we knew whether severe cases were missed in the trial we could tell whether to accept the authors' conclusions; as it is we are in the dark The authors admit that early cases will be missed by miniature mass radiography so that this technique will not protect individuals from progression to a more advanced stage]

C. M Fletcher

MAISANI, A Possibilità di accertamento della

v 7, Nos 1/2, 7–14, 3 text figs. & 6 figs on 6 pls

The Odelca camera which was used in this investi-

detailed in the text Some of the subjects examined worked in a marble quarry; the mineral contains comparatively little silica, most of the work takes place in the open air and the material is mostly worked under wet conditions, so that there is hardly any risk of silicosis in this case The other group of subjects examined were employed at the production of cinnabar and mercury—mining, grinding and smelting the ore Under the National Industrial Insurance laws, the latter workers are subject to periodical medical examination and their clinical records were available to the present investigator. He has carried out 226 X-ray examinations at the marble works and 472 among the cinnabar workers—698 examinations in all There was evidence of pneumoconiosis in 45 persons, of whom 17 showed only the initial phase of the changes [In the early part of his paper the author states that there was hardly any silica hazard to the marble workers and all 45 cases must, therefore, have been found at the cinnabar and mercury works; the punctuation of the printed article does not make this quite clear.]

The reflecting type of photographic objective absorbs less light and allows of a shorter exposure than is the case when a dioptric lens is used, and the Odelca camera which was used in this investigation proved particularly suitable for showing the very fine changes in the chest shadows which are characteristic of the very early phases of silicosis—pin-point mottling and early reticulation—which were elicited in 17 of the subjects examined *J. Cauchi*

COURBAULT, R Le dépistage de la silicose pulmonaire par radiophotographie. **[The Diagnosis of Silicosis by Mass Radiography]** *Arch. Malad. Professionnelles* Paris. 1953, v. 14, No 2, 140–43.

The value of mass radiography is stressed; it does not keep the worker long from his work and the cost is one-tenth of that of large films. But the apparatus used must be excellent and standardized, otherwise the film will not stand up to magnification for accurate reading Interpretation of X-ray films is always difficult, and a tendency exists to find silicosis when the subject is known to be exposed to silica dust When a general population is being examined some 63 per cent are found normal and definite silicosis is rare. Many pulmonary conditions, such as bronchopneumonia, pleurisy, tuberculosis or new growth may cast shadows difficult to diagnose

[illegible]

but less than [illegible] facture of sanitary ware has its risk, owing to exposure to dust arising in various processes, especially in enamelling, and the dust from the refractory clay may contain silica. In foundries again there exists considerable exposure to harmful dusts,

[illegible]

as such seems to play only an accessory rôle *E. L Collis*

CAZA[illegible]

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notes]

The author maintains that silica dust is radiotranslucent, and that silicotic fibrosis requires to be impregnated with calcium before it becomes radiologically apparent. [No evidence is adduced in support of this curious thesis] For this reason an interval of varying length may elapse between the inhalation of silica dust and the appearance of radio-[illegible]

[illegible]

not be dr[illegible] dust exposure This the [illegible] tion " [illegible] are preser[illegible] periodic [illegible] lactic effect in men exposed to a serious silicotic risk, since they may have started on inevitable progression before any radiological signs appear. Dust suppression is the only way of preventing this type of case It is conceded that in men exposed to less acute risks removal to dust free work after radiological signs of pneumoconiosis have appeared may "favour ultimate stabilisation of the lesions ".

[The author rejects the paper by COCHRANE et al (this *Bulletin*, 1951, v. 26, 908) which advocates* periodic medical examinations for the prevention of [illegible] these authors " have [illegible]

[illegible] moconiosis of coal workers does not progress without continued dust exposure His confusion is presumably due to his failure to distinguish between silicosis and [illegible] again without [illegible] for other [illegible] and pro- [illegible]] [illegible] sentation [illegible] ment of [illegible] of dust exposure [illegible] *letcher*

*p. 217

ZANETTI, E 10 anni di attività schermografica del "Centro per lo studio e la prevenzione delle pneumoconiosi". **[Ten Years of Radiological Examinations at the Pneumoconiosis Research and Control Centre]** *Rass Med Indust* Turin 1952, Jan–Feb, v. 21, No 1, 1–10

This is a summary of the radiological work carried out for the control of silicosis and tuberculosis

The diagnoses made as a result of these examinations included reticular shadows in 18,389 (7 4 per cent) and silicosis in 4,410 (1 9 per cent) Among the latter 3,071 (1 3 per cent) showed nodular shadows, 994 (0 42 per cent) confluent or massive shadows, and 345 (0 14 per cent) showed the silicosis to be associated with an active tuberculous process There was a suspicion of active tuberculosis in 1 6 per cent of the cases

Compared with 1941–48, the 1949–50 period showed a higher incidence of reticular shadows (which may have been due to improved diagnostic

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summary

This survey covers a total of 31 workers, of whom 5 showed an initial fibrosis mainly affecting the
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age, job, duration of exposure, clinical signs and X-ray findings in each of the 31 cases

The results of the survey suggest that the type of silicosis acquired in these occupations is mild and only slowly progressive: in 43 per cent of these workers the affected lungs had remained at the stage of reticulation and showed no tendency for the pathological changes to progress further.

That silicosis in these occupations is relatively benign is shown by the continued duration of exposure to risk in these subjects The lung fibrosis was found in 50 per cent of workers who had been exposed to this occupational inhalation of silica dust for up to 10 years, in 60 per cent of those at this trade for 10–20 years, in 55 per cent of those employed for 20–30 years and in 50 per cent of those at this work for 30–40 years

J. Cauchi

WORTH, G. & NERRETER, W. Kritische Betrachtungen bei der Beurteilung der Silikose und Siliko-Tuberkulose unter Vergleich von klinischröntgenologischem und pathologisch-anatomischem Befund. **[Critical Comments on the Assessment of Silicosis and Silico-Tuberculosis by Clinical and X-ray and Autopsy Findings]** *Beiträge z. Silikose-Forschung* 1954, No. 30, 1–30, 7 figs [10 refs]

Discrepancies sometimes occur between the results of clinical and X-ray examinations, on which silicosis compensation awards are based, and the findings on the same cases at autopsy

In order to study the correlation between clinical and pathological results a group of silicosis records from the Rhineland were examined A total of 355 cases included about 150 iron ore miners, 95 coal miners and 100 miscellaneous other miners Full data were available for only 327 men where the

recognized during life

Attempts are made to explain why discrepancies between clinical and post mortem findings occurred.

A further section of the paper deals with silico-tuberculosis Comparisons on 207 cases showed that in 32 per cent silico-tuberculosis diagnosed clinically was not confirmed post mortem, in 4 per cent. it had not been found clinically, and in 64 per cent there was agreement.

In a large group of 401 cases silico-tuberculosis was found at autopsy in 43 per cent; of these 80 per cent. were actively progressive. Most of them had silicosis stage II or III.

Silicosis of the hilar lymph nodes, usually not diagnosed clinically, was found in one-third of the cases It was more prevalent in iron ore miners than in coal miners and this is said to be due to the higher quartz content of the dust.

Bronchitis also tended to be underestimated clinically. It was found in 80 per cent of the cases at autopsy, and was chiefly present in stage III silicosis. Some degree of bronchiectasis also was found

in nearly half the cases at autopsy although it was only rarely found clinically.

[illegible]

HARDING, H E & DAVIES, T A L. **The Experimental Production of Radiographic Shadows by the Inhalation of Industrial Dusts. Part II. Zircon ($ZrSiO_4$).** *Brit. J Indust. Med* 1952, Jan., v 9, No 1, 70–73, 7 figs

The use of zircon to replace silica in a number of industrial processes gives great importance to its possible toxicity It may be used as a parting powder in foundries, and could be substituted in paints and washes Previous animal experiments with concentrations of 7 to 25,000 particles per cc of air caused no poisoning, but, curiously, no zircon could be found either by radiography or microscopically in the lungs of the animals The work was repeated, with rats exposed for 6 hours daily, 5 days a week for 144 days, and then for 8½ hours daily, 5 days a week for 20 days The dust concentrations were excessive and varied from 37,000 to 130,000 particles per cc. of air ; 80 per cent of the particles were below 1 micron and very few exceeded 5 microns Some of the animals also received the dust by intratracheal injections Only small amounts of dust were found in the lungs. The reason for this scarcity remains unsolved As in the case of dust of iron oxide [this *Bulletin*, 1948, v 23, 863]*, zircon produced X-ray shadows with complete absence of fibrosis. The findings are illustrated There was an entire failure to set up any toxic reactions to the zircon particles in the lungs Small aggregates of cells were found densely packed with phagocyted particles which can cause dense X-ray shadows

Zircon is far less toxic than silica , *possibly it is* completely inert Its dust is not readily inhaled into or retained in the lungs, which do not react to its presence It provides a desirable substitute for silica *E L Collis*

FOUBERT, P , BALGAIRIES, E., DECLERCQ, G. & [illegible] "egg- [illegible] Type [illegible] *alad.* [illegible] o. 3, 263–70, 3 figs

The subject discussed is the calcifications of the pulmonary glands known by Americans as "egg-shell". Short notes on 19 cases, of whom 18 were in miners are given, with X-ray illustrations of three The condition has been reported from various countries, from Germany, Great Britain, France and Italy, as well as America It affects men of all ages who have contracted silicosis after at least 15 years' exposure to the dust hazard The appearances of "egg-shell" are definite with spheroidal or oval shadows from 1 to 2 cm in [illegible]

superimposed tuberculosis would seem to be a second contributing factor. Indeed, tuberculous infection is accepted as a precursor of all calcifications in the lungs, and calcifications of the lymphatic glands are no exception. Dust particles gathered from the air passages are carried in the lymph stream to the glands which, if the particles are silica, become damaged by them, and such damaged tissue readily becomes the site of calcareous deposits A third factor also plays a part in determining the intensive deposition of calcium in the lymph glands, what may be called personal diathesis or predisposition or some stress ; the nature of such a factor is obscure, only its manifestation is notable.

E. L. Collis

ROCHE, L Valeur de la tomographie pulmonaire dans l'expertise de la silicose **[The Value of Pulmonary Tomography in appraising Silicosis]** *Brit J Indust. Med.* 1951, Oct , v 8, No 4, 236–43, 10 figs

Pulmonary tomography, by presenting, plane by plane, details of the intra-thoracic organs, helps in appraising the damage done to the lungs by silicosis By this means lesions otherwise obscured by cardiac or glandular shadows can be discovered, and their shape and size determined The shadows seen call for expert interpretation. By tomography not only can the appearances of silicotic fibrosis be disclosed, but also the state of the rest of the pulmonary parenchyma, the aspect of the trachea, of the large bronchi, and of the tracheo-bronchial glands A number of illustrations indicate the pictures obtained. [illegible] in association [illegible] Tomography [illegible] and lateral [illegible] o right, and from right to left Emphysema, in particular, is a condition clearly distinguished by tomography Silicosis, especially when complicated by tuberculosis, frequently raises difficulties in accurate diagnosis, to the solution of which tomography lends considerable aid. Experience is needed to obtain full value in the interpretation of the shadows seen

E. L. Collis

BONTE, G , BALGAIRIES, E , TRINEZ, G & DECLERCQ, G La tomographie axiale dans l'étude de la silicose pseudo-tumorale **[Axial Tomography in the Study of Advanced Silicosis]** *Rev Méd. Minière.* Douai. 1953, v. 6, No. 24, 36–48, 3 text figs & 12 figs on 5 pls [34 refs.]

*v. II, 248.

The authors describe how during the past 5 or 6

movements of the subject in relation to the X-rays

ZANETTI, E & CARDANI, A La stratigrafia nello studio radiologico della silicosi **[Stratigraphy [Tomography] in the Radiological Study of Silicosis]** *Med. d. Lavoro* 1954, Feb, v. 45, No 2, 65–83, 14 figs [36 refs] English summary

Dorland's dictionary defines stratigraphy or body-section radiography *[tomography]* as a method of X-ray examination whereby a desired layer or section of the body is visualized and photographed to the exclusion of other layers SCHULTE and SCHUTZ have called this method "the anatomical examination of the living lung" This technique is particularly useful in silico-tuberculosis where silicotic fibrosis tends to mask tuberculous cavities; emphysematous

49 silico-tuberculosis By occupation, 57 were miners (of whom about half were employed on tunnel construction), 7 worked with abrasives, 5 with sand, 5 were firebrick masons at foundry ovens, 5 were rock

reproduced. Five of these showed tuberculous cavities which had not been demonstrated by the standard X ray examination, at which 3 other cases had been suspected and the presence of their cavitation only confirmed by stratigraphy.

In cases of pin-head mottling, stratigraphy is particularly useful to demonstrate those early lesions of silicosis which affect the hilar and neighbouring glands The technique brings out the emphysematous lesions of nodular silicosis In massive fibrosis, this technique helps to assess the exact nature of the shadows seen and to demonstrate any distortions of the tracheo-bronchial system due to sclerotic and other stresses *J. Cauchi*

MOL

v 21, No. 2, 97–109, 10 figs

The authors are in the Ear, Nose and Throat

ORLANDI, O, CONCINA, E & BELLION, B Quadri broncografici nella silicosi e nella silico-tubercolosi **[The Bronchographic Picture in Silicosis and Silico-Tuberculosis]** *Rass Med Indust* Turin 1951, Nov–Dec, v 20, No 6, 416–20, 4 figs

The authors indicate the value of the bronchographic method of examination in silicosis, advise

examination include. detection of the presence of bronchial spasm which may be the only alteration in early cases, deformities of the bronchi met with in more advanced cases and which include changes in

calibre, with segmentation, irregularities of the walls, numerous small diverticula, and relative dilatation of peripheral portions interpreted as due to loss of elasticity and tone of the bronchial wall and the first step towards the production of cylindrical bronchiectasis. In the silicotic, bronchiectasis has no peculiar characters; it arises from changes within the bronchi such as chronic bronchitis causing deformity or stenosis, or externally by traction of fibrotic areas or compression by massive consolidation, conditions which interfere with the structure and nutrition of the bronchi and favour dilatation. In the more advanced stages pronounced stenosis, with amputation of the bronchial trunks, is not infrequent; it is due to compression and to the fibrotic process Finally bronchography can resolve doubts on the nature of areas of high light penetration seen in normal radiographs and tomographs, for example, bronchiectatic cysts, tuberculous cavities with negative sputum, and emphysematous bullae Bronchographic examination should not be regarded as a mere luxury method of diagnosis, but rather as a useful complement to clinical and functional examinations and an indispensable means of determining

WORTH, G Bronchographische Studien bei Silikose **[Bronchographic Studies in Silicosis]** *Beiträge z. Silikose-Forschung.* 1952, No 17, 61 pp, 38 figs. [55 refs]

screen Indications for and against bronchography are listed, and there is a detailed study of the findings in four groups of patients with varying degrees of

informative. The dearth of stethoscopic findings is instructive

H. G. Calwell

CONCINA, E & ORLANDI, O Reperti broncoscopici nella silicosi e nella silico-tubercolosi **[Findings of Bronchoscopy in Silicosis and in Silico-Tuberculosis]** *Rass Med. Indust* Turin, 1951, Nov-Dec, v. 20, No 6, 424-6.

main bronchi, and modifications in the orifices of the lobes and segments; lavage, and aspiration of the bronchial secretion during the process, provides the best means of obtaining material for bacteriological examination; bronchoscopy also enables endobronchial administration of adrenaline and antibiotics The more severe bronchial lesions observed are seen in patients with marked dyspnoea, frequent cough and scanty or abundant expectoration

Inflammation of the mucous membrane is one of the first reactions to inhalation of silica dust, it may be acute or chronic, and localized or spread over the whole bronchial tree It appears as redness,

mucosa of the trachea and main bronchi is atrophic and looks pale and thin, and the cartilages are prominent while in other parts of the bronchi there may be inflammatory oedema and increased secretion In the more advanced cases of silicosis the fibrotic process in the lungs brings about rigidity of the trachea and main bronchi and may cause displacement The mucosa at the bifurcations of the trachea and main bronchi may show marked oedema, redness and increased irritability, with reduction of calibre of the orifices of the lobes and segments, causing atelectasis in the corresponding areas of lung The authors did not find spasm of the large bronchi frequently in their cases, spasm was controlled by insufflation or direct application of adrenaline It

emphasized

CESÀRO, A. N, SOSSAI, M, FAZZI, P & POZZA, E L'angiocardiopneumografia nella silicosi polmonare. **[Angiocardiopneumography in Pulmonary Silicosis]** *Med d Lavoro* 1951, Dec, v 42, No 12, 355-64, 6 figs [15 refs] English summary

Fourteen cases of silicosis have been examined by serial angiocardiopneumograms (A C.P G) with an apparatus which can automatically take 6 successive X-ray photographs at intervals of 1 second Apart

from the automatic action, the equipment can make the serial exposures at longer intervals Except for one case of transitory headache, no untoward effects followed the injection of 50–60 cc of a 70 per cent iodine preparation (*sostanza iodata*) into the jugular or the elbow veins Only 3 of the patients had reached the stage of massive silicosis and A C P G carries an element of risk in such cases they showed little or no vascularization of the silicotic masses, the blood

particularly thick at the hilum Little or no appreciable change was evident in the A C P G of the early cases The nodular cases showed a slowing down of the pulmonary circulation The authors suggest that lesions of the blood vessels are important factors in producing respiratory impairment in cases of silicosis
J Cauchi

SCARINCI, C. Lo studio angiopneumografico del polmone silicotico [**The Angiopneumographic Study of the Silicotic Lung**] *Med d Lavoro* 1951, Dec, v 42, No 12, 365–9, 4 figs English summary (7 lines)

Silicosis causes a progressive impairment of respiration which affects the oxygenation of the

second, or nodular, and the other the massive stage of silicosis and giving an angiopneumogram and an ordinary X-ray photograph from each, Scarinci

studying the functional condition of the lungs in silicosis
J Cauchi

The many changes in the pulmonary tissues brought about by the silicotic processes are discussed The

tissue, and obscured by zones of emphysema produced not only by changes in the pulmonary tissue but caused also by pressure on bronchi by silicotic glands at the roots of the lungs. Such changes lead to reduced function of the respiration and circulation by reducing the gaseous interchange through the alveolar walls. Tomography is successful in representing main bronchi and vessels, but for the smaller peripheral branches it is insufficient Since the adoption of the use of selective angiography with

These newer methods of examination reveal to the clinician the morphology of the main respiratory and circulatory channels and also enable valuable conclusions to be reached on the complex pathophysiological reciprocal exchanges between the air and blood streams. Besides the injury to the ventilation and circulation, with the impairment of normal respira-

cardio-pulmonary system is perfected

[The 17 illustrations from radiographs showing

BRISTOL, L J **Roentgenologic Aspects of Silicosis and Asbestosis.** *Arch. Indust Health.* Chicago. 1955, Mar, v 11, No. 3, 189–95, 9 figs

This paper gives a short account of the methods of classification of silicosis and asbestosis used in the Department of Radiology at the Trudeau-Saranac Institute, and records a good relationship between measurements of the residual air and differences in the area of respiratory and inspiratory chest radiographs There are no references to the literature
C. M. Fletcher

ANSOLA JIMÉNEZ, J, LABBÉ, V., DE YAZIGI, Victoria G & SCHUELER, P. Neumoconiosis Revisión de 717 casos de silicosis pulmonar **[Pneumoconiosis. Examination of 717 Cases of Pulmonary Silicosis]** *Med Deporte y Trabajo.* 1950, July, Aug, Sept, Oct, Nov & Dec, v. 15, Nos 90, 91, 92, 93, 94 & 95, 3486–92, 3534–44; 3598–612; 3662–76, 3748–63; 3822–8, 14 figs.

30 per cen
glass indu
silicosis
was officially established for ...
diseases and carrying out periodical medical examinations and for other scientific and administrative me... ...al hygiene

mi...

20,000 in coal mines, 30,000 in the nitrate industry and the rest in various metalliferous mines including iron, gold, silver, manganese, etc Other industrie... ...rtant quart... refractory ...asive soaps, ...le ...garding the aetiology and pathogenesis of silicosis are accepted The diagnosis depends on a detailed occupational history, clinical examination and radiographs made by competent persons and with technically satisfactory equipment.

After a review of various systems of classifying radiographic changes, the National Classification, now in use in Chile, is described It comprises five phases or stages: F.H, normal, F P I., initial or incipient fibrosis; F N I., initial nodular fibrosis, F N M, marked nodular fibrosis; F N C., confluent nodular fibrosis Photographic reproductions of chest radiographs give a fair indication of the five stages other than normal in this classification, and of silico-tuberculosis A brief description of each ...

... obsolete lesion and laboratory examination ... negative; and (2) that for which the designation is reserved, and in which an active tuberculous lesion is proved

The table on p 139 shows the industries and processes in which the 717 workers, found to be ... were engaged, and the classifi-

...e engaged ...ed 15,000 ...otrenllc... others ...y work... a low

between 11 and ... per cent ... as a modified form of silicosis. The number ... workers employed in the coal mines was about 20,000 nine cases of silicosis were found In the mining of nitrate 30,000 workers were employed, chiefly on the surface, and the risk of silicosis was slight; only ... cases were found among workers known to have worked solely in nitrate mining An investigation in the quartz and glass industry showed a high incidence of silicosis of over 3 per cent, the cases showed rapid development and an increased tendency

Industry or Process	Classification of Disease							
	F N I.	F N I. to F N M	F.N M	F.N M to F N C	F N C	Total Silicosis	Silico-tuberculosis	Total
Copper mining	188	54	160	23	48	473	47	520
Gold mining	5	2	6	1	2	16	2	18
Iron mining	—	—	—	—	—	—	—	—
Lead or manganese mining	0	0	1	1	0	2	0	2
Coal mining	1	3	2	1	2	9	0	9
Nitrate mining	1	0	2	1	0	4	0	4
Stone, granite etc industries	6	3	8	3	5	25	6	31
Quartz and glass industry	11	7	21	3	8	50	30	80
Ceramic industries	8	1	1	0	0	10	1	11
Abrasive soaps industry	1	0	1	1	1	4	0	4
Cement industry	9	2	12	0	2	25	2	27
Refractories, metal and colour industries	1	1	3	1	5	11	0	11
Total	231	73	217	35	73	629	88	717

[illegible] of workers were under 40 years of age compared with 45 per cent in the other industries There was no evidence of racial predisposition to silicosis

Pre-existing tuberculosis was found in 2 2 per cent of the 717 cases of silicosis, this was the same as in a general survey made by the Institute on 24,000 persons Antecedent cardiovascular lesions were found in 2 6 per cent of the 717 cases and in 1 4 per cent of the controls The incidence of syphilis, shown by serological tests, was 7 9 per cent in the silicosis cases compared with 1 6 per cent among the 24,000 persons [illegible]

[illegible] proved silicosis

Considered in regard to physical types the 717 patients comprised 13 8 per cent asthenic, 74 4 per cent normal or athletic, and 11 7 per cent pyknic, the asthenic type showed more advanced lesions, and 36 3 per cent of the cases of silico-tuberculosis were of asthenic type

Examination of the period of employment showed a higher risk in the quartz and glass industry, in [illegible] within 10 years and 58 per cent within 5 years of commencing employment, all the cases of silicosis appearing within one year were in that industry

Tuberculosis occurred as a complication in 37 5 per [illegible] 46 5 per [illegible] compared [illegible] the total 717 patients, 74 were without symptoms Slight increase of weight was noted in 2 9 per cent, moderate loss of weight was observed in 14 3 per cent in silicosis and 31 8 per cent in silico-tuber[illegible] tuberculosis

Laboratory investigations are described Tubercle bacilli were found in 57 9 per cent. of the 88 cases of silico-tuberculosis, by direct examination of sputum or gastric contents or by cultivation or inoculation Anaemia was found only in cases of silico-tuberculosis, erythrocytosis was present in 40 per cent of cases of silicosis, but exceeded 6 millions in only 2 3 per cent; this increase was not found to be related to the altitude of the places of work There was no evidence of the leucopenia sometimes described, but moderate leucocytosis was found in 29 3 per cent of silicosis, and 43 6 per cent. of silico-tuberculosis; marked leucocytosis of over 12,000 was found in 3 9 per cent of silicosis and 26 4 per cent. of complicated cases A deviation to

the left in the Veléz index was found in 14 5 per cent. of silicosis and 45·9 per cent of silico-tuberculosis There was lymphocytosis in 27 1 per cent of silicosis and 9·1 per cent of silico-tuberculosis Marked eosinophilia was not found; counts of over 5 per cent were found in 11·2 per cent. of all the cases Sedimentation rates were normal (under 10 mm in one hour) in percentages of 93, 83 and 70, respectively, in the first, second and third stages of silicosis,

amounts of silica in the blood and the severity of the pulmonary fibrosis The silica content of the sputum was determined in 54 cases of silicosis.

Fourteen of the patients in this series died during the investigation, but, owing to difficulty in collecting the findings of the autopsies from different hospitals, a special description is presented of the results of

17 with inactive tuberculosis and 38 of silico-tuberculosis, complicating lesions included pleural changes, emphysema and pneumothorax; hypertrophy of the right side of the heart, bronchitis, bronchiectasis, non-tuberculous cavitation, and tuberculous cavities The causes of death in this series were silicosis alone 6, cardiac insufficiency 7, and pneumonia 1, pulmonary abscess 1, Pott's disease 1, and silico-tuberculosis 51 In the general hospital of El Salvador the 17 cases of silicosis included 4 of silicosis alone and 13 of silicosis with tuberculosis

Silicosis is regarded as a chronic and essentially progressive condition In many cases progression is arrested by removal from exposure to dust, but the authors affirm emphatically that in many instances the disease progresses after removal from exposure In illustration of this three pairs of chest radiographs are reproduced which show, respectively, advances

workers remaining at work while under observation, 6 were employed in the quartz and glass industry, 5 of these developed tuberculosis within 6 years and one continued to progress as silicosis, of the remaining 76, employed in mining, 63 showed no progression, 11 progressed as silicosis and two developed tuberculosis

The term silico-tuberculosis is reserved for the coexistence of demonstrable silicosis with active tuberculosis This study included 88 cases of silico-tuberculosis, 12 2 per cent. of all the cases, th proportion in the quartz and glass industry wa 37·5

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83·3 per cent, deviation to the left in the neutrophile in 45 9 per cent, generally with normal or lowered lymphocyte count; erythrocyte sedimentation rate was altered in 91 per cent. In 29 cases silicosis was associated with inactive tuberculosis, determined by all available means

Emphysema was diagnosed in 25 1 per cent of the 717 cases, increasing in frequency with the advancing stages of the disease, chronic bronchitis and

pulmonale were under 40 years of age, cyanosis was present in 1 3 per cent, accentuated pulmonary second sound, without hypertension, was found in 11 9 per cent, 4 7 per cent had arterial hypertension.

A history of one or more acute pulmonary conditions was given in 18 8 per cent of the cases, but pneumonia developed in only 1·1 per cent of patients with silicosis who were kept under observation during a period of 8 years, a figure not dissimilar from that in the general population One case of pulmonary abscess and 4 of pulmonary cancer were observed in the 717 cases

The subjects of prevention and treatment are discussed, with references to the literature The article ends with observations on the difficult topic of respiratory incapacity and its assessment The methods which, in the opinion of the authors, appear most likely to be realized are (1) determination of

inspiration and expiration; determination of dyspnoea, by observing pulse and respiration and arterial pressure, and the effect of 20 "flexions". Results showed alterations in 19 5 per cent first stage, 32 0 per cent second stage, 55 7 per cent third stage, of silicosis, and in 66 2 per cent of cases of silico-tuberculosis

The practical medical control of exposure to dust is summarized in a table, the following points may be mentioned · When a worker is found in the first stage of definite silicosis (F N I) he is examined periodically; but if the condition has developed rapidly he should be removed from all work involving exposure to a risk of silicosis, when suspended he is considered to be entitled to compensation of 20–40 per cent In the second stage, marked nodular fibrosis (F N M) the incapacity would be 50–100 per cent The third stage of silicosis, and silico-tuberculosis would be considered as total and permanent incapacity and he would be awarded a life pension. In Chile industrial diseases are assimilated

to industrial accidents and the risk is covered by the law which provides protection for them

E L Middleton

ANSOLA, J., LABBE, V., GARCIA, Victoria, REYES, A. & SCHULER, P. Silicosis pulmonar Revisión de 717 casos [**Pulmonary Silicosis. Examination of 717 Cases**] *Rev. Med Chile* 1952, Jan., v 80, No 1, 21–33, 6 figs. [51 refs]

In this article the authors review the subject of silicosis and describe, in considerable detail, the

[illegible]

summarizing some of the special points emphasized by the authors

[illegible]

were represented by 231, 217 and 75 cases respectively; 108 were in transitional stages, and 88 were diagnosed as silico-tuberculosis. The industries in which the disease was most prevalent were metalliferous mining, chiefly copper, and the glass and quartz industry; the latter showed the highest incidence and included all the 14 cases of rapidly developing silicosis, 2 of these were workers exposed to high concentrations of quartz dust for less than 6 months, and 5 out of the total of 14 developed tuberculosis within 6 years

Among the various factors which were regarded as

[illegible]

per cent were complicated by tuberculosis The most frequent complications of silicosis were, emphysema, 25 1 per cent, chronic bronchitis, 18 4 per cent; tuberculosis, 12 2 per cent and chronic cor pulmonale, 3 0 per cent.

E L Middleton

BALDI, G. *Situazione nel 1950 di 463 silicotici ricoverati in Clinica del Lavoro dal 1943 al 1947* [**A 1950 Survey of 463 Cases of Silicosis which had been treated in the Clinica del Lavoro during 1943–47**] *Med d Lavoro* 1952, Apr., v 43, No 4, 147–59 English summary

In 1950 the author reviewed the cases of 463 workmen who had attended the *Clinica del Lavoro* for silicosis during the period 1943–47; 212 (46 per cent) had died from silicosis in the meantime and the 251 survivors have been re-examined both clinically and radiologically The records of 1943–47 showed that 53 (11 per cent.) then had reticular fibrosis, 204 (44 per cent) nodular or patchy silicosis, and 152 (33 per cent.) massive silicosis, while in the remaining 54 (12 per cent) silicosis in one or other of these forms was associated with active, open tuberculosis of the lung

On re-examination in 1950, 19 of the 251 subjects (4 per cent) showed reticular fibrosis, 84 (18 per cent) showed nodular or patchy shadows, 126 (27 per cent) had massive silicosis, and 22 (5 per cent) had silico-tuberculosis.

In other words, the review of these 463 cases showed that 46 per cent. had succumbed, the condition of 14 per cent. had remained stationary, 30 per cent had got worse and 10 per cent had got very *much worse*

Of the 53 workmen who had shown reticular fibrosis in 1943–47, 9 had died, 21 had got worse and 5 much worse, while 18 had shown no change. Of the 204 with nodular silicosis, 55 had died, 82 got worse, 28 much worse, and 39 had shown no change Among 152 with massive silicosis, death had supervened in 100, while 29 had got worse, 15 *much worse and 8 showed no change*

Of the 54 workmen who had been diagnosed as silico-tuberculous, 48 had died by 1950 and 6 had survived, including one who had recovered from his tuberculous infection, 17 workmen who had been found with silicosis in 1943–47 had since developed tuberculous infection The various findings are analysed by type of silicotic occupation. In the case of sand-workers death had supervened earlier, average age at death being 47 years Chisellers had succumbed at a later age, average 60 years. For all deaths, age averaged 51 years Measured from date of admission to the *Clinica* the average survival period was 2 years 2 months for the 10 cases who had shown reticular fibrosis, and one year for the 48

[illegible]

causes

[illegible]

contribute the lowest proportion (10 per cent) of deaths, and their lesions show little tendency to progress. In those workmen who contracted silicosis after only a few years of being at risk the disease was much more rapidly progressive than in those who showed no signs or symptoms until after 25–30 years *of exposure to the dust hazard*

Progress to the nodular and confluent stages does not seem to be affected by giving up the work. Confluent cases showed very rapid deterioration Independent of further exposure to the risk, when it

*v II, 89

X-rays showed, widely distributed over the whole lung region, nodular shadows of acinous size or less, rather markedly opaque, ill-defined in outline, with patches of nodular confluence in both subclavicular

the size of a hazel-nut and showing no definite structure; these were to be seen along the lateral edge of the right lung, in the subclavicular region and in the middle field. There was marked evidence of a general emphysema, more particularly at the bases.

In the light of the long-standing exposure to the occupational hazard—tunnelling for 15 years some of which was through siliceous rock—the authors attribute the extensive parenchymatous changes to nodular silicosis which had reached a confluent stage; the ring shadows are due to emphysematous bullae which stand out better because of the spontaneous pneumothorax. The effort dyspnoea and the cough are due to advanced silicosis, while the sudden pains and the worsening of the dyspnoea are due to the onset of the pneumothorax. Bullous emphysema is caused by obstruction in the smaller bronchi which, in due course, leads to stretching and rupture of groups of alveoli leading to the formation of round cavities of varying size Perhaps as a result of pleural adhesions or of otherwise lessened resistance of the pleural layer, a bulla eventually ruptures and leads to a spontaneous pneumothorax. An uncommonly favourable combination of X-ray and other signs and symptoms facilitated the diagnosis in this case it is often difficult to demonstrate the signs of bullous emphysema by X-rays

J Cauchi

BAADER, E W Ein Silikosesteinespucker **[A Case of Silicotic Stone Spitting]** *Arch f Gewerbepath u Gewerbehyg* 1954, v. 13, Nos 1/2, 58–72, 8 figs.

The paper gives a detailed description of an ornamental stone-mason who had suffered from the rare

suffering from silicosis A number of examiners gave very discordant opinions on the degree of silicosis Temporarily he suffered from bronchiectasis with high temperatures

During this time and also intermittently later he coughed out stones which could be identified as sili-

Each time after coughing up a lot of such stones the patient felt better and his general health improved greatly during 1951–1953, the period of observation by the author. Thus the coughing up of indurated silicotic tissue must be considered as a kind of self healing of the lung No trace of organisms causing either tuberculosis or histoplasmosis could be found.

G. Nagelschmidt

CROSSLAND, P. M. **Silicon Granuloma of the Skin.** *Arch. Dermat* 1955, Apr., v. 71, No 4, 457-61, 2 figs [23 refs.]

Traumatic granuloma of the skin due to silicon compounds is rare; but the author claims that such granulomata occur. They appear after a more or

active part in the development of the sarcoid li lesions caused by the broken bulbs A new case silicon granuloma is reported The patient abrade her knee on gravel Eleven years later granulomat appeared at the site of the gravel trauma Th microscopic appearance of a biopsy specimen illustrated Crystals are seen surrounded by epi thelioid cells The lesions regressed spontaneously

E. L. Collis

SAITA, G & ZAVAGLIA, O La funzionalità renal nei silicotici **[The Renal Function in Silicosis]** *Med d Lavoro* 1951, Feb, v 42, No 2, 41- [20 refs] English summary

albuminuria in 20 per cent, a deficiency of chlorides in 15 per cent, a rise in blood nitrogen 40 per cent. and a drop in the blood cholester in 30 per cent The results of turbidity and flocculation tests on the blood serum were found positive in every case

the changes may be the result of the elimination of silica through the kidneys The authors tend to favour a third possible explanation, namely, a disturbance of the reticulocyte system which upsets the exchange of proteins and lipids and which is due to the presence of silica in the body *J Cauchi*

RAULE, A & GRISLER, R Sui valori dell'androgenuria nei silicotici **[The Significance of Androgenuria Levels in Silicosis]** *Med d. Lavoro* 1951, Nov., v 42, No 11, 337–43, 1 fig [10 refs]

The English summary appended to the paper is as follows —

aemia during effort, chronic fatigue and perhaps a toxic action of silica

"These causes would first stimulate, and then depress the activity of the adrenal cortex"

[16 refs]

The English summary appended to the paper is as follows —

"Biological estimation of the prehypophyseal gonadostimulins in the urine of 20 patients suffering from pulmonary silicosis in various stages was carried out, by using the Varney and Koch method

"In 13 of these patients insufficient gonadotropic elimination was found In 10 of them insufficient urinary elimination of the 17 neutral ketosteroids was noted in addition and in 9 cases the Thorn test

VYSKOČIL, J **Endocrine Functions in Silicotics.** *Arch. Indust. Hyg & Occupational Med* Chicago 1954, May, v. 9, No 5, 402–13 [27 refs.]

In order to determine whether the endocrine make-up influences the reaction to inhaled silica dust, 51 persons with varying grades of silicosis were closely examined from the endocrinological point of view in a Czechoslavakian institution; the many tests used are enumerated Efforts were made to detect metabolic deviations. The subjects often presented rather pronounced asthenia, little subcutaneous fat and signs of hypoandrogenia and positive thyrotropic activity A decreased 17-ketosteroid excretion was detected, roughly parallel with an increased sedimentation rate, with a low systolic blood pressure, and a reduction in timed vital capacity A detailed survey is given of the endocrine function examinations, which are also summarized in a convenient table

Silicosis is not a simple endocrine disease, but silica acts by way of hormones on the lymphoid tissue and plasmocytes, and hyaluronidase and proteolytic enzymes increase the inflammatory reaction. Freed histamine affects this reaction, both directly and indirectly, through epinephrine A constant action and reaction is continually taking place between the various hormones, thus there may be a relative excess of desoxycorticosterone, growth hormone, and androgens, on the one hand, over the adrenocorticotrophic hormone and 11-oxysteroids on the other Physical fatigue and such additional inflammation as tuberculous infection cause stress and hormone shifts which the organism tends to master by fibrosis

silicosis has already begun it may be benefited by corticotrophin and cortisone in small doses. Insulin may be given "alternatively with" corticotrophin The whole pattern of endocrine reactions is far from clear *E. L Collis*

MEYER, F. & SOLOMON, S **X-Ray Diffraction Study of Sputum in Silicosis.** *Arch Indust Hyg. & Occupational Med* Chicago. 1951, Nov., v. 4, No. 5, 443–5, 1 fig

HAMLIN, L E **Differential Diagnosis of Siderosis and Silicosis.** *Indust Med & Surgery.* Chicago. 1952, Jan, v 21, No. 1, 1–4, 8 figs.

Siderosis is a benign pneumoconiosis resulting from the deposition of inert iron dust in the lungs, without fibrosis or disability. Its appearance on X-ray examination is, however, exceedingly like that of silicosis Because the implications of a diagnosis of silicosis are so vastly different for the patient in regard to health, economic status and disability, it is of utmost importance that the clinician should be able to distinguish the two conditions. Under the 5 headings—occupational history, environmental surveys (dust counts, analyses, etc), physical examination, pathology, and X-ray findings, the author tabulates the features of siderosis and silicosis which enable an accurate diagnosis to be made

The illustrations are good reproductions of X-ray films and photomicrographs of lung sections of siderosis and silicosis in man, and siderosis in experimental animals. *A. T. Doig*

NICOD, J. L Silicose, sténose bronchique et emphysème **[Silicosis, Bronchial Stenosis and Emphysema]** *Schweiz med Woch.* 1953, Sept 26, v. 83, No 39, 920–21, 1 fig

The contention is advanced that in cases of pneumoconiosis emphysema results from bronchial stenosis following upon pronounced and massive lesions in the hilar glands of the lungs, quite apart from the occurrence of any moderate or advanced pulmonary silicosis

In support of this contention the author instances a man who died at the age of 52, who had worked as a ...

... hilar glands, indurated and slate-coloured, their lymphoid tissue being replaced by hyaline fibrous masses, tattooed with dust. A similar coniotic sclerosis was present in the abdominal glands The pulmonary tissue showed only moderate nodulation; and no tubercle bacilli could be found, nor were they detected during life A brother of this man had previously been reported to be similarly affected

Another case is also mentioned, an agricultural worker with short exposure to dust while coal mining; many years later he developed respiratory trouble in winter. After death pronounced emphysema was found with no signs of any silicosis or of tuberculosis Yet a third case is quoted of emphysema found in a man with some 5 years' exposure to anthracite dust while mining [The evidence is too slight to base any conclusion on it] *E L Collis*

SARTORELLI, E L'enfisema polmonare nella silicosi giudicato in base al rapporto fra aria residua e volume polmonare totale **[Pulmonary Emphysema in Silicosis]** *Med. d. Lavoro* 1955, Jan, v. 46, No 1, 25–34. [Numerous refs]

The English summary appended to the paper is as follows:—

"The present research was carried out to show the incidence and the severity of pulmonary emphysema associated with silicotic fibrosis

"The estimation of emphysema was made first by subjecting all cases to an accurate clinico-radiological examination; results obtained were then compared with those given by measurements of the residual volume and by the calculation of the ratio $\frac{\text{residual volume}}{\text{total pulmonary capacity}} \times 100$ which, according to Motley, affords a sufficiently exact estimation of the severity of the emphysema

"The residual volume was measured with the method of Cournand and coll[eagues] According to this method the residual volume is calculated by measuring the quantity of nitrogen which can be extracted from the lungs when pure oxygen in an open circuit is inhaled by the subject

"33 silicotics were examined The results are as follows·

"1) Clinico-radiological investigations revealed the presence of pulmonary emphysema in half of the cases of pin-head silicosis and in all nodular (8 cases), nodular confluent (5 cases) and massive silicosis (6 cases). Emphysema becomes more severe, with the exception of [a] few cases, passing from the nodular form to the confluent and massive forms of silicosis

"2) The measurements of the residual volume and the calculation of the ratio $\frac{\text{residual volume}}{\text{total pulmonary capacity}} \times 100$ showed the presence of pulmonary emphysema in 11 out of 14 cases of pin-head silicosis and in all subjects affected with other forms of silicosis Emphysema was almost always slight or mild in cases of pin-head and nodular silicosis, whilst it was always found to be severe or very severe in cases of confluent or massive silicosis.

"3) By comparing the clinico-radiological with the functional data, it appears that the latter revealed the presence of an emphysema in 4 silicotics in whom no sign of emphysema was detected at the clinico-radiological examination. Furthermore, in another 13 silicotics, the ratio $\frac{\text{residual volume}}{\text{total pulmonary capacity}} \times 100$ showed the existence of a more severe emphysema than would have been expected on the basis of the clinico-radiological data It must, however, be acknowledged that, for the estimation of the emphysema in many silicotics, the data resulting from an accurate clinico-radiological examination have agreed with the functional data

"On the basis of the results obtained it is maintained that the clinico-radiological examination is sufficient for the estimation of severe emphysema

in silicotics, whilst the study of the ratio $\frac{\text{residual volume}}{\text{total pulmonary capacity}} \times 100$ *is more reliable for an exact estimation of slight or mild emphysema.*"

PARRISIUS, W. Bronchitis und Silikose. [Bronchitis and Silicosis] *Beiträge z Silikose-Forschung*, 1950, No. 10, 31–43.

Stage of silicosis	Per cent Bronchitis 1948	1949
0–I	43·6	35
I	27 9	34
II	27·0	29
III	24 9	34
Total	30·1	32

... later.

Entirely different figures have been published from Bochum, based on examinations of out-patients. Only 3–6 per cent of several thousand working silicotics were found ...

... the usual progression in severity with time of work but there is no difference at all between the two groups ...

... the epithelial lining ciliated cells being replaced by goblet cells He concludes from this that bronchitis may be a change of defence mechanism, dust removal by mucus being substituted for ciliary activity ...

BÖHME, A. & LENT, H. Silikose und Bronchitis. [Silicosis and Bronchitis] *Beiträge z Silikose-Forschung* 1951, No. 11, 1–10.

Stimulated by observations in Switzerland and South Wales of the frequent occurrence of bronchitis and emphysema in silicotic subjects, the authors made a statistical examination of patients in the Augusta Hospital in the Ruhr. The difficulties of diagnosing bronchitis are mentioned and only well-defined cases, in which signs were audible on examination, were included

Among 503 non-miners 15·5 per cent, and among 1,085 miners 29 1 per cent, had bronchitis. Prevalence at different ages was:

Age	20–40	40–50	50–60	60–80
	Percentages			
Non-miners	9 8	15 9	14 6	24·3
Miners	13 2	22·5	32·6	45·1

This shows an increase with age and about twice as much bronchitis in miners as in non-miners ...

Age	20–40	40–50	50–60	60–80	Total
Non-silicotic	12 3	44·8	53·1	75·6	41·9
Silicotic	14 6	19 7	23 5	37·6	26 5

The high incidence of bronchitis in miners without silicosis is stated to be surprising and to merit further study It may be that men in this condition suspect they may have silicosis and therefore visit hospital; it may also be that some of them have early silicosis which is radiologically not clearly distinguishable.

A further breakdown of the figures according to stages of silicosis showed that up to stage 2 there was no increase in bronchitis below the age of 50, but the figures for stage 3 were high and varied only between 43 and 47 per cent ...

... cases predominated.

Severe chronic forms of bronchitis could perhaps be separated in further attempts to subdivide the data. This has not been done but the statement is made that these severe and often emphysematous

forms are seen chiefly in early and only very rarely in advanced cases of silicosis. The authors do not believe the explanation proposed by WIESINGER to be correct that the bronchitic process washes the dust from the lungs.

Finally the authors stress the need for further data and observe that the results of similar statistical examinations depend very much on the type of population sampled. *G. Nagelschmidt*

BECKMANN, H. Häufigkeit der Bronchitis im Verhältnis zum Lebens- und Berufsalter, sowie Grad der Silikose (Erstes Teilergebnis der Untersuchungen auf den Gruben). [**Frequency of Bronchitis in relation to Age, Years Underground and Degree of Silicosis**] *Beiträge z. Silikose-Forschung*. 1951, No 11, 11–26, 4 figs

This is an interim report on the frequency of bronchitis in working miners from a number of collieries in the Ruhr, who were examined with a mobile X-ray outfit before or after work. The time which had elapsed after leaving work was never more than 90 minutes, and the results so far show no difference between "before" and "after" examinations. Increased bronchial spasm of silicotic men at work had been found by LENT [this *Bulletin*, 1951, August]* and the present findings suggest that such bronchial embarrassment is quickly lost on return to the surface.

Of a total of 3,507 men examined, 477 were excluded as suspect of tuberculosis and 152 for other reasons. This left an uncomplicated group of 2,878 miners with or without silicosis. The working age distribution reflects the effect of the war period:

Years underground	0–5	6–10	11–15	16–20	21–25	over 25
Per cent.	37	6	8	7	14	28

The prevalence of silicosis found was

Silicosis stage	0	0–1	1	1–2	2	2–3	3
No. of men...	1,235	820	671	48	60	35	9
Per cent. ..	42 6	28 5	23 3	1·7	2·1	1·2	0 3

*See below.

out. For complete information working miners and those in hospitals or elsewhere should be examined. More people in other industries must also be examined before it is possible to assess correctly the effects of the following factors on the incidence of bronchitis:— siliceous dust, other dust, humidity of the air, rapid changes of temperature. *G. Nagelschmidt*

FRIEHOFF, F. Die Bewertung statistischer Zahlen bei der Beurteilung der Zusammenhangsfrage zwischen Silikose und Bronchitis. [**A Statistical Evaluation of the Relation between Silicosis and Bronchitis**] *Beiträge z. Silikose-Forschung* 1952, No. 16, 1–15, 7 figs

A number of authors have determined the incidence of bronchitis among silicotics at various stages of silicosis. The results show very large divergencies. After discussing reasons for observer error in diagnosis and reasons due to different populations being studied (for instance in- or out-patients) the author calculates the ranges of the various published results from the numbers of people examined, using 99 per cent confidence limits, and shows the results in the form of graphs. These graphs show that some but not all the divergencies of results are insignificant. It is further shown that the incidence of bronchitis is equally high for non-silicotics and those having Stage 3, the most advanced stage of disease, whereas the incidence is lower for the less severe stages of disease. This again suggests that all present results are spurious because they are not based on a sufficiently large number of observations. *G Nagelschmidt*

LEN[illegible] ... von ... esti- ... 95[illegible]

Tests were made to assess the relation betwe[illegible] bronchial spasm and silicosis in German coal miner[illegible] by measuring maximum breathing capacity (M B C. and vital capacity (V.C.) before and after injection o[illegible] ... in 1 ml.) or inhalation of aleudrin ... school ... M B C ... line in- ... recog- ... creases ... miners ... wed no ... e injec- significant increase of ... tion. Patients suffering from asthma on the other hand, or acute or chronic bronchitis, showed increases ranging from 25 to 80 per cent. There are, however, objectionable sequelae associated with the injections, especially in subjects not suffering from bronchitis. It is concluded that increases up to 25 per cent. are "physiological". Larger increases are only found associated with acute or chronic bronchitis.

their M B C in the dusty atmosphere, the bronchitic silicotics showed only 5 per cent reduction M B C. and V C measurements in the laboratory

inhalations underground

Tests on factory workers showed that physical labour by itself causes a slight increase in M B C.,

KENNEDY, M C S Nachweis von Bronchialspasmen mittels spirometrischer Aufzeichnung der Vitalkapazität und der maximalen Atemkapazität. (Gekürzte Fassung) Vortrag gehalten am 28 9 1949 vor dem ärztlichen Beirat des Silikose-

The results of simultaneous registration of V C. and M B C. with the apparatus of GILSON and HUGH-JONES are described for a group of seven silicotics. The interpretation of the curves is discussed. It is possible to calculate the M.B C from the rapid registration of the V.C and to assess the loss of elasticity of the lung The increase of M B C and V C. after adrenaline injection is also demonstrated

G Nagelschmidt

NADIRAS, P., MICHOT, R, DELESVAUX, R, BATIQUE, L. & PENNEL, J Silicose et pneumopathies aiguës [**Silicosis and Acute Pulmonary Infections**] *Rev Méd Minière* Douai 1950, v. 3, No. 11, 67–91, 31 figs on 10 pls [23 refs]

The effect on silicosis of acute pulmonary infections, other than tuberculosis, has not been widely studied, but it has been suggested that such acute lesions favour the development of pneumoconiosis. This question was investigated in 34 cases of acute pulmonary infections occurring among a population of about 25,000 coal miners. The lesions affected the pulmonary parenchyma and ran an acute course; tuberculosis was excluded. Particulars of each case are given in detail

A summary shows that the periods of employment in the mines ranged from 7 to 39 years, average 21 years, 22 men had been employed on rock work

1; reticulo-nodular, 9, micro-nodular, 6; nodular,

The conclusions reached as a result of this investigation were · there was no evidence that acute pulmonary infective processes, other than tuberculosis, determined the appearance of pneumoconiosis, or that they had any ultimate influence on the general development of the pneumoconiosis, in one case in which lateral radiographs were not available some doubt remained about a localized change after lobar pneumonia, where functional impairment was found it could be explained by pathological processes other than any effect of the acute condition on the pneumoconiosis It appeared that the intercurrent acute processes played a very unimportant part in the pneumoconiosis, if, indeed, they had any part at all [It is to be noted that this study refers to the effect of acute conditions on pneumoconiosis, not the converse, moreover, the type of pneumoconiosis may be important, with asbestos, and also with bagasse, the occurrence of acute infections is of major importance, and the effects are probably dependent on the presence of both conditions.]

E. L. Middleton

GALY, P La silico-tuberculose et les tuberculo-pneumoconioses [**Silico-Tuberculosis and the Tuberculo-Pneumoconioses**] *Arch Malad. Professionnelles* Paris 1953, v. 14, No 6, 573–83, 7 figs.

French compensation law requires differential diagnosis between silicotic fibrosis with its typical nodules and the caseous nodules of pulmonary tuberculosis The tuberculosis may be present before the dust fibrosis commences, or, by its presence, it may advance the fibrosis, or it may occur superimposed upon an old, well recognized silicosis Simple silicosis is described, and its association with exposure to dust of free silica for long periods Its nodular fibrosis

throws X-ray shadows which are bilateral and vary in intensity with the depth of the silicosis and the amount of black pigment in the nodular masses. The findings due entirely to inhaling different dusts, whether of free silica, asbestos, fluor-spar, anthracite or coal, must be ascertained first, then the findings due to tuberculosis lesions may be distinguished. But every grade of combination occurs and accurate differentiation may be impossible.

tuberculosis but would not affect a nodule due to silicosis Tuberculosis is the cause of death in about 50 per cent. of silicotics, the disease being rapid and resistant to treatment Tuberculous lesions are not bilaterally symmetrical. The long evolution of silicosis over 10 to 20 years with progressive bronchitis and dyspnoea is distinctive An attempt is made to group phthisis as seen in men exposed to industrial dusts into 4 categories, and illustrations of the X-ray appearances are presented

The presence of tuberculosis in a known case of silicosis may be detected clinically by loss of weight, asthenia, fever, and raised blood sedimentation, with nothing else to explain them; X-rays may help by demonstrating rapidly changing shadows indicative of caseous foci; and tomography may assist. The picture painted is one, except in clear-cut instances, of intense difficulty in diagnosis which can only disappear when the presence of tuberculosis at any stage of silicosis is recognized to be part of the clinical process.

E. L Collis

MOGINIER, H. Aspects de la complication tubercu- ... [Con- ... Sili- ... *Un-* ... v. 43, No. 1, 51-66, 3 figs

Except for a little anthracite which was worked during the war, mining in Switzerland consists in ...

complicated by tuberculosis. When this was first instituted a post-mortem examination had to be conducted before a claim to compensation could be sustained; in all, information from 153 of such examinations was available for the present investigation. Of these persons, 133 had been rock miners and the others had similar dust exposures in other occupations. Efforts are made to estimate the influence of age and of length of exposure upon the development of silicosis; but the smallness of the figures when distributed into groups and the irregularity of the dust exposures render inconclusive any deductions drawn, except possibly to those watching over the disease in Switzerland. Of those with silicosis, 63 per cent. presented tuberculous lesions. No indication, however, is given that samples from the tissues were submitted to guineapig inoculations to determine the presence of tuberculosis not obvious to microscopic examination. The information regarding some of the cases establishes that working in the Alpine galleries for less than two years may be enough to induce active silicosis.

E. L Collis

MOGINIER, H. Aspects de la complication tuberculeuse dans la silicose des mineurs valaisans [**Consideration of Tuberculous Complications among Miners in Valais**] *Ztschr. f. Unfallmed. u Berufskrankh* 1950, June 15, v. 43, No 2, 128-35, 1 fig. [13 refs]

This article is a further contribution to the previous abstract; and is based upon further consideration of the evolution and anatomo-pathological lesions seen in the same 153 fatal cases of silicosis which occurred among Swiss ... engaged in driving tunnels in the

the average expectation of life at every age. Sixty-five per cent of the cases showed tuberculous lesions at post mortem The shortening was slight in those who commenced their work under age 30, and increased at later ages There was no evidence of the tuberculosis existing before the silicosis, or of tuberculosis being required to transform early dust-reactions ...

extensive The rigidity of pulmonary tissue affected with silicosis stands in the way of efficient collapse ...

dustiness. In 25 out of 119 cases the exposure to dust was less than 2 years, although the silicosis had a fatal termination. [No mention is made of what steps are being taken to minimize the extent of the dust hazard, which must be excessive when boring quartz rocks in long galleries No wonder 2 years of exposure is enough.]

E. L. Collis

SANDI C, S La silicotuberculosis en nuestros obreros mineros [**Silico-Tuberculosis among the Miners of Oruro, Bolivia**] *Hoja Tisiológica* Montevideo 1951, Dec, v 11, No 4, 330–38 [13 refs]

The author, who is the medical officer of the social insurance fund in Oruro, Bolivia, describes the pulmonary disease which is prevalent among the workers in the ancient metal mines of that region [situated in the Andes at an elevation of about 12,000 ft]

Employment in the mines is preceded by a medical examination which, except in one or two undertakings, does not include radiological examination; after a period of training the young recruits undertake machine drilling, and are exposed to constant inhalation of dust containing silica in greater or less proportion; they are subjected to fatiguing work and are exposed to great variations of temperature between the hot, badly ventilated mines and the cold winds met with in the open, they are poorly nourished and are addicted to alcohol After 2 to 4 *years' work pre-existing tuberculous lesions become* active, and the worker applies to the social insurance fund, nearly all the miners who contract silicosis eventually die of silico-tuberculosis

[illegible]

size and form, and presenting areas of aggregation usually in the middle and upper zones, and, in the terminal stages, evidence of cavitation These patients live in poverty with their families, thus providing sources of infection

The frequency of silicosis, silico-tuberculosis, tuberculosis, and chronic bronchitis, considered as occupational diseases for the purposes of social insurance [illegible]

[illegible]

tuberculosis appear, when they are regarded as totally unfit for work Cases of tuberculosis alone appear after less than 3 to 6 years' work in the mines Silicosis and silico-tuberculosis have been found to appear one or two years after leaving the mines

A high proportion of the population are employed in the mines and in the absence of even elementary rules of hygiene for dust suppression, with excessive temperature variations, humidity, lack of personal hygiene, and alcoholism, respiratory disease con- [illegible]

[illegible] mines

E. L Middleton

DU TOIT, F S **Tuberculo-Silicosis.** *South African Med J* 1954, Oct 2, v 28, No 40, 845–50, 10 figs

[illegible] the occurrence of [illegible] South Africa [illegible] of work under- [illegible] nd macroscopic evidence of silicosis appears has become longer and longer, the number of miners developing tuberculosis, apart from silicosis, has not appreciably decreased. Wet drilling and improved ventilation underground have lessened the silica hazard The incidence of tuberculosis keeps notably low, notwithstanding heat, dampness and lack of sunshine underground. Not a few Africans with open tuberculosis are working in the mines.

[illegible] numerous in the glands than in the lung tissue. X-rays can hardly detect early changes; and to mention silicosis to the miner often sets him thinking about compensation, even though no incapacity exists.

The case histories of ten instances, typical but difficult to diagnose, are given and the X-ray appearances of the lungs in these patients, are illustrated. [illegible]

[illegible] frequent examinations and repeated X-rays. If only tuberculosis could be eliminated the problem of silicosis would be greatly simplified

E. L. Collis

SAITA, G & CATTANEO, E. Silicosi e tubercolosi nell' industria della ceramica, della porcellana e del gres ceramico Considerazioni statistiche e clinico-radiologiche **[Silicosis and Tuberculosis in the Earthenware, China and Stoneware Industries. A Statistical, Clinical and Radiological Study]** *Rass Med Indust.* Turin. 1954, May-June, v. 23, No 3, 133-56, 2 figs [24 refs]

In this paper the authors first make a comprehensive survey of the processes and the raw materials, and of the dust-producing factors, which are involved in the 3 branches of the pottery industry referred to in the title, namely, earthenware (glazed or unglazed), chinaware and stoneware [*grés ceramico*] The paper then gives some reference to other work which has been published on this subject. The authors have studied the records which have been [illegible]

40,821 X-ray photographs were kept, many of the subjects having been radiologically examined more than once

The records show an overall incidence rate of silicosis in 3 2 per cent of the workers. In the pottery industry, those workers who are engaged in handling the raw materials show the highest incidence rate for silicosis, at 7 4 per cent The process of making the moulds carries the next highest hazard, with an incidence rate of 6 6 per cent Moulding includes a variety of processes such as pouring and packing the raw mixtures, turning, stamping and so on, and silicosis was found in 4 8 per cent of these workers Four per cent of those employed on brushing the baked article, 2 7 per cent. of those engaged at the ovens or kilns and 2 3 per cent. of the finishers developed silicosis The stoneware industry carries the highest silicosis hazard and shows an incidence rate of 8 4 per cent , the rate among workers in chinaware is 4 1 per cent and in earthenware (glazed or unglazed) 2 9 per cent The order of all these incidence rates corresponds to what one would expect from studying the amount of dust produced, the size of the dust particles and the consequent silicosis hazard at the various points of the processes involved, which include the handling of the raw materials and of the manufactured product at various stages of finishing

Of those patients with silicosis, 0 9 per cent had been exposed to the risk of silica dust for under 10 years, 8 8 per cent had worked for 10–19 years, 19 per cent. for 20-29 years and 40 per cent for over 30 years. The silicosis rate among pottery workers is higher than the average for all workers at dust-exposing occupations in Italy, only 2 other industries, namely, the refractories and the extractive industries, show higher rates in silicosis incidence. Tuberculosis, active or probably so, was found in 1 7 per cent of pottery workers

The rate of development of the disease was studied from a selection of the fuller records in the series Silicotic changes are revealed by X-ray examination of pottery workers after an average period of 15 years' exposure and there is a rapid progress towards nodular and massive fibrosis. The X-ray picture is not always typical and may often show single patches of condensed fibrosis against a background of "pin-point mottling" without evidence of the intermediate stage of nodulation; the patches are generally subclavicular and the condition tends to develop into confluent fibrosis of the upper lobe with severe basal emphysema. The presence of tuberculosis or of pleural lesions tends to favour rapid progress of the silicotic fibrosis; pleural adhesions restrict chest movement and pulmonary ventilation and favour the retention of the dust which has been inhaled.

J. Cauchi

SAITA, G. & TUROLLA, R. Considerazioni statistiche e clinico-radiologiche sulla silicosi nei lavoratori addetti alla fabbricazione delle mole abrasive e degli abrasivi flessibili. **[Silicosis and Tuberculosis in an Abrasive Wheels and Abrasive Paper Industry]** *Med d Lavoro.* 1953, Mar, v 44, No. 3, 124–33, 3 figs. English summary.

Grindstones may be made of natural stone or of a compound, the latter may consist of oxide of aluminium or of carbide of silicon or of boron A binder is used to hold the abrasive particles together in these artificial grindstones and in sand or emery paper or cloth.

The manufacture of artificial grindstones entails a number of successive processes, namely, (1) preparation (grinding, screening, etc) of the raw materials; (2) mixing these with a binder, (3) moulding; (4) drying; (5) rough shaping on a turn-table; (6) baking; and (7) turning on a lathe

The manufacture of flexible abrasives entails (1) spraying a binder over the paper or cloth; (2) spreading the graded abrasive material over this and (3) drying and maturing

The authors refer to the measurement and the mineralogical analysis of the various abrasive particles concerned and report the results of their investigations into the incidence of silicosis and tuberculosis among 1,329 employees in this industry The cases dealt with extended over the period 1940–1951 and involved 3,423 X-ray screenings and 727 X-ray photographs

The lungs of 196 subjects (14 7 per cent.) showed reticular shadows, while a total of 32 (2 3 per cent) showed evidence of silicosis, which was associated with tuberculosis in 3 (0·2 per cent). The highest incidence of silicosis, at 10 per cent, was found among those employed at processing the flexible type of abrasives. The process of preparing the raw materials seems to present the next highest risk with an incidence of 8 3 per cent., and baking and drying account for a 7 2 per cent. incidence of silicosis. Tuberculosis in an active, or suspected active, form was found in 2 6 per cent , mostly in the 51-60 years'

age group According to length of exposure, silicosis incidence increased from 0 23 per cent. in those who had been in the industry for less than 5 years to a maximum of 57 14 per cent. in workers who had been exposed to the hazard over a period of 30 years or more

The X-ray picture of silicosis in this industry tends to be atypical at times. In the less hazardous jobs the changes often stop at the stage of reticulation, while the more risky tasks may result in early, rapidly progressive, disease with cases of massive silicosis after only 7 years of exposure

J Cauchi

ZANETTI, E & DOMPÈ, M Silicosi e tubercolosi nelle fonderie di acciaio **[Silicosis and Tuberculosis in Steel Foundries]** *Med d Lavoro* 1950, Dec, v 41, No 12, 321–68, 12 figs [20 refs] English summary

Investigations carried out from 1940 to 1948 on 13,560 workers employed in 33 steel foundries, by means of mass miniature radiography, provided the material for this study, the miniature radiographs were followed by clinical and full-scale radiographic examinations where necessary The results were classified according to the occupation, age and duration of employment of the workers

The summarized results of radiographic examination were as follows (the percentages in parentheses) normal, 11,403 (84 05), increased striation, 730 (5 38), reticulation, 1,089 (8 03), nodulation, 228 (1 68), confluent or massive shadows, 81 (0 59), silicosis with active tuberculosis, 29 (0 21), total classed as silicosis, 338 (2 49) The occurrence of tuberculosis was classified separately inactive, 1,947 (14 35), possibly active, 223 (1 65), probably active, 150 (1·10), total, active and inactive, 373 (2 75).

Classification by age showed that the incidence of silicosis and tuberculosis increased with age, especially over 50 ; a similarly progressive incidence was found with increased duration of employment, especially over 20 years. The highest incidence of the condition diagnosed as silicosis, that is including nodular and massive shadows and silicosis with tuberculosis, was found among the 243 sandblasters, with 18 cases (7 40), 2,569 engaged in stripping and rough fettling, 169 cases (6 57), 624 on furnace brick-laying, 37 cases (5 92), 371 on welding and oxyacetylene cutting, 17 cases (4 58), 198 on preparation of moulding sand, 7 cases (3 50) Among workers in the earlier foundry operations, including preparation [illegible]

evidence of nodular silicosis was found after relatively short exposure Twelve reproductions of radiographs of each of these two groups show the different appearance of the so-called foundry lung of the first group, and the nodular form, with a tendency to confluence, of the second group

Prevention is considered under general technical [illegible]

include annual periodical examinations by miniature radiography, suspension from the work of those affected by tuberculosis, and transfer of workers with uncomplicated silicosis to work where atmospheric dust concentrations do not exceed about 500 particles per cubic centimetre of air.

E. L. Middleton

AKAZAKI, K, SAITO, K, SATO, I & SATO, Y **Autopsy Findings of Silicosis, with special reference to Tuberculous Complications of the Lungs.** *Acta Path Japonica* 1951, Mar, v 1, No 2, 107–16, 8 figs on 2 pls [11 refs]

Japan comes late into the study of silicosis Here are given findings from 37 autopsies collected over 10 years, 21 of the men had worked in a gold mine; 14 in a copper mine, and 2 in a lead and zinc mine The content of free silica in the gold mine was 58 per cent, in the copper mine 19 per cent ; and in the lead and zinc mine 12 per cent The men had been exposed to hazard from 3 years 4 months to 31½ years The findings from these cases are summarized in one table

Tuberculous infection was noted in 29 of the 37 cases, and bronchitis was seen in every instance. Pneumonia was the direct cause of 3 deaths. No instance of pulmonary cancer was seen Only 3 were simple silicosis, and the lesions were distributed symmetrically over both lungs As regards tuberculous infection, in many cases the exudative tendency was predominant and retarded resorption of exudate was characteristic The presence of this superimposed infection seemed to accelerate the silicotic fibrosis Otherwise no new observation is reported The illustrations are not especially informative

E L Collis

KERGIN, F G **Silicotic & Tuberculosilicotic Lesions simulating Bronchiogenic Carcinoma.** *J. Thoracic Surgery* St. Louis, 1952, Dec., v. 24, No. 6, 545–65, 12 figs

The X-ray appearance of massive shadows in silicosis or tuberculo silicosis may simulate bronchial carcinoma The masses may be unilateral and suggestive of atelectasis and no nodulation may be apparent. The author presents 8 such cases, in 7 of which the symptoms also were suggestive of lung cancer

Seven patients were subjected to thoracotomy, pneumonectomy being performed in 5, lobectomy in 1 and biopsy in 1 At operation or on subsequent examination the specimens were found to exhibit a characteristic appearance with adherent parietal pleura, a

segmental distribution, black or grey colour, marbled or mottled. Though not shown radiologically, nodules were palpable in the rest of the lung. A notable feature was enlargement of the hilar glands with compression of the bronchus of the affected segment, and consequent distortion throughout its length, narrow and dilated areas, and inflammation, sometimes ulceration, of the mucosa. Microscopically the masses showed varying degrees of chronic inflammatory reaction, from thickening of the alveolar walls and reduction in the size of the alveolus to total replacement with masses of fibrous tissue. Throughout these areas were masses of laminated hyaline material characteristic of the silicotic reaction, and the small firm nodules in the rest of the lung were also typical. The hilar glands were very fibrosed and showed silicosis.

The pathogenesis of these lesions depends on gradual bronchial obstruction leading to a chronic inflammatory process with resulting dense fibrosis. The importance of exposure to silica in these cases is in its effect on the lymph glands. The author draws attention to the long latent period that existed in several cases between the last exposure to silica and the development of the lesion. The problem of treatment is influenced by the necessity of thoracotomy for diagnosis. Lobectomy is rarely possible because of the very extensive fibrotic reaction and for this reason pneumonectomy is difficult. The author, however, regards the results of the operations as satisfactory. All the patients are alive; the 6 treated by excision have been relieved of their complaints although all have dyspnoea, which is severe in 3 cases. It is suggested that the condition be called "chronic silicotic lymphadenitis with obstructive pneumonitis (non-tuberculous or tuberculous)".

A T Doig

FLORIS, M., SANNA, G. & FLORIS, G. Considerazioni diagnostiche su alcuni casi di silicosi e di silico-tubercolosi. **[Diagnostic Aspects of Some Cases of Silicosis and Silico-tuberculosis]** *Rass Med Indust* Turin 1953, Mar–Apr, v 22, No. 2, 65–103, 35 figs. [36 refs]

The relation between tuberculosis and silicosis is not only of scientific and diagnostic interest but also of social importance. Some of the more notable reports regarding the association between these two conditions are examined and the various criteria in the history, clinical examination and special investigations which may be of use in their differentiation are discussed.

Fourteen cases are described in detail with good reproductions of radiographic findings. Reasons are given for their classification into 3 groups—4 of pure silicosis, 3 of simple tuberculosis and 7 where the two diseases co-exist. Great emphasis is laid in the value of strati-radiography over the standard X-ray procedure as (1) Nodular condensation is better seen; (2) the limits of large opaque shadows are more clearly defined; (3) unsuspected cavities may be revealed.

C O. S Blyth Brooke

SAITA, G. & DI NARO, C. La ricerca del bacillo Koch nell'escreato dei silico-tubercolotici microscopio a fluorescenza, con il metodo della auramina. **[Examination for Tubercle Bacilli in the Sputum of Silico-Tuberculosis Patients, with the Fluorescence Microscope and the Auramine Technique]** *Med. d Lavoro.* 1952, Aug–Sept, v. 43, Nos 8/9, 291–7. [12 refs] English summary

This study refers to 22 patients, who were suffering from advanced silicosis, nodular in some and confluent in others, and in whom clinical, X-ray and laboratory (sedimentation rate, Arneth count etc) examination had raised suspicions of an associated tuberculous infection. For the fluorescence method, the authors used a 1 : 1,000 solution of Bayer's auramine in 5 per cent. phenol. They stained thin smears of sputum with this for 7 minutes (instead of 14 as advised by HAGEMANN). They next gave a differentiating bath of 6 minutes in a solution containing 4 cc of fuming hydrochloric acid and 4 gm sodium chloride in 1,000 cc alcohol, and examined under the fluorescence microscope at 600 diameters, through a yellow filter to reduce dazzle. Both the arc lamp made by Leitz and the fluorescent microlamp made by Zeiss-Winkel gave equally good results.

The authors tabulate the results which they obtained in each case by Ziehl-Neelsen staining and by auramine, both on direct smears and after enrichment, and by guineapig inoculation in cases where the microscopic examinations had proved negative. Specimens from some of the cases were examined on several successive occasions to follow the effect of treatment.

The authors found the auramine method slightly more sensitive than Ziehl-Neelsen staining, quantitatively as well as qualitatively. In one case, which proved positive on guineapig inoculation, no tubercle bacilli could be demonstrated by either microscopic method of examining the sputum. The auramine method is simple and rapid, but requires more elaborate equipment, may entail some eye strain and calls for more skill in interpreting results, which are obtained without having to wait as with culture or guineapig inoculation.

J. Cauchi

VORWALD, A. J., DWORSKI, M. & PRATT, P. C. **The Use of Quartz Dust for challenging the Viability of Tubercle Bacilli in Tuberculous Lesions.** *Amer Rev Tuberculosis* 1954, May, v 69, No 5, 841–2

Tuberculous lesions sometimes contain acid-fast bacilli which cannot be recovered on cultivation or by guineapig inoculation. The question arises, are they alive or dead? On the assumption that finely divided quartz dust stimulates infection by the tubercle bacillus, the authors have devised a technique for mixing the contents of tuberculous lesions, removed surgically from patients under chemotherapy, with a suspension of quartz particles less than 3 microns in

size, and injecting the mixture into guineapigs Control guineapigs received the tuberculous material without the quartz.

The reaction of Middlebrook-Dubos is concerned with the agglutination of red cells sensitized with tuberculin, by serum dilutions of 1 in 16 or more Since

were tuberculous, while 16 miners with no pneumoconiosis but with tuberculosis acted as a control group Positivity of the reaction was found to depend upon the presence of tuberculosis, rather than upon the presence of silicosis So much was this so that the low proportion of positivity found in advanced cases of silicosis is against the widely accepted claim that the passage of isolated nodules to more advanced confluent silicosis is dependent upon a superimposed tuberculous infection The reaction may thus contribute evidence in the differential diagnosis between miliary tuberculosis and micronodular silicosis

E L Collis

STOJADINOVIĆ, M Hematalaško diferenciranje čiste silikoze od siliko-tuberculoze **[Hematological Differentiation between Silicosis and Silico-Tuberculosis]** *Arhiv Hig Rada* Zagreb 1951, v 2, No 1, 48–62, 18 figs (17 on 9 pls)

The English summary appended to the paper is as follows.—

"Benda's method of granulo-diagnosis enables us to make definite statements about the existence of active tubercular process The method consists in identifying different kinds of polymorphonuclear neutrophils in blood smear, and in determining their

pletely cured of tuberculosis), Type G+ and G++ (active tuberculosis), and Type GN (persons who have never been in contact with tuberculosis)

"As there is no reliable differential-diagnostic method for discrimination between silicosis and silico-tuberculosis, the Antitubercular Station at

minimum of equipment Benda's original method

BOSELLI, A & LUSARDI, C La terapia con streptomicina e acido paraminosalicilico della tubercolosi attiva ed aperta associata alla silicosi polmonare **[Active and Open Pulmonary Tuberculosis Associated with Silicosis Treated with Streptomycin and PAS]** *Med. d. Lavoro* 1950, Oct, v 41, No 10, 268–77. [17 refs] English summary

Twenty-three cases are reported upon and the

ranged from grave to moderate The sputum was positive in all Five received only streptomycin, one only PAS, the remainder were treated with both drugs Three patients who had started with streptomycin alone relapsed, with signs of resistance to the drug, within 6–8 weeks after treatment; 2 of these, but not the remaining one, reacted favourably when PAS was added to the treatment.

Most of the patients were first given PAS in doses of 10 gm for the first 4–6 days, after which doses of 50–80 cgm (some severe cases with high fever received doses of as much as 1 gm.) of streptomycin were given daily in addition In some cases, this combined treatment was kept up for as long as 5 or 6 months The aggregate total dosage of PAS varied between 200 and 1,800 gm, that of streptomycin between 15 and 70 gm Signs of intolerance to either drug were infrequent and in only one case of persistent intolerance to PAS had this drug to be stopped altogether.

In 14 cases the tuberculous condition had supervened on the silicosis. Seven cases were severe but did very well on this treatment 2 went home after a stay of 60 days and 6 months respectively, 4 went on to a mountain sanatorium and another patient was expected to be so transferred at the time when this paper was being written. These 7 patients improved rapidly in all their symptoms and signs, other than the X-ray picture; their

sputum became and remained negative. In 5 other patients the disease had been less severe; they, too, improved dramatically under the combined treatment, their sputum becoming negative in 30 to 90 days. 4 went home and the other patient was transferred to a sanatorium. An artificial pneumothorax was attempted in several of these cases but was achieved in only one. The remaining two patients in this group remained sputum-positive and showed little benefit from the treatment.

The other 9 patients, in this series of 23, had both silicosis and tuberculosis without evidence of a sequence between the two diseases In 3 no cavity was seen on X-ray examination, PAS-streptomycin treatment proved successful and the sputum became negative. X-rays showed cavity formation in the remaining 6 cases and these showed little, only temporary, improvement from the combined treatment.

J. Cauchi

LANG, F. Die Streptomycinbehandlung bei Siliko-tuberkulosen. **[Streptomycin Treatment in Silicosis with Tuberculosis]** Reprinted from *Mitt. der med. Abt. der Suva* Lucerne 1951, Jan., No 27, 8 pp.

There are few records in the literature of the value of streptomycin in the treatment of silicosis with tuberculosis. Since many requests are still being made for the treatment of such cases, both by doctors and by the patients, even when the condition is far advanced and indeed hopeless, the results of treatment with streptomycin in [illegible] patients [illegible] improvement, but in only 4 of these 7 was even partial working capacity restored.

The author has as yet no sufficient experience of combining streptomycin with PAS or other drugs in the treatment of these cases, to form a judgment of its value, but this method is to be studied.

M. E. Delafield

NEEF, W Die Behandlung der zu entschadigenden Siliko-Tuberkulose mit Chemotherapeutica und Antibiotica. **[The Treatment of Compensatable Silico-Tuberculosis with Chemotherapeutic Drugs and Antibiotics]** *Beiträge z. Silikose-Forschung* 1954, No. 30, 31–47, 1 chart. [18 refs]

This paper reviews the experience of the last 3 years of a large miners' hospital in the Ruhr, both on out-patients and on in-patients, who were usually only kept for up to 12 weeks, 286 patients were treated, each at least for 6 months.

Conteben (thiosemicarbazone) was used first (50–75 mgm per day) and found occasionally to delay or inhibit spreading of active tuberculous lesions. PAS was tried, but used only very little as it was not tolerated in cases of progressive disease and seemed no better than Conteben. Streptomycin was used on in-patients with acute disease and it had a much better general effect than the other drugs. Nevertheless it is considered to do no more, in a proportion of cases, than delay the final progression of advanced active tuberculosis.

Use of isoniazid started in 1952. This was effective in some cases but on the whole not as effective as in tuberculosis not complicated by silicosis

Inhalation therapy was also used but was on the whole less effective than oral administration except in specific affections of the larynx.

The author summarizes his experience by saying that advanced silico-tuberculosis could not be cured and there was no significant reduction in X-ray appearances. However, the progression of the disease was in certain cases notably delayed

A periodic change-over from streptomycin to Conteben and isoniazid (Neoteben or Rimifon) is considered the best for long-lasting treatment

The extent and degree of tuberculous and silicotic lung changes influence both the progression and the effectiveness of such treatment.

G. Nagelschmidt

VORWALD, A. J, DWORSKI, M, PRATT, P C. & DELAHANT, A B **BCG Vaccination in Silicosis.** *Amer Rev. Tuberculosis* 1950, Nov., v. 62, No. 5, 455–74, 20 figs [20 refs]

A series of experiments were carried out to determine the course of infection with the BCG strain of *Myco tuberculosis* in guineapigs inhaling silica dust The BCG strain was grown for 12 days on Sauton's medium, A suspension of this growth, containing 0 1 mgm, moist weight, was used for intracutaneous injection and a suspension was also used for inhalation infection. Animals were exposed to quartz dust for 8 hours daily, six [illegible] months, both from the experimental and control groups, over a period of 14–18 months

In the first experiment animals were inoculated intracutaneously with BCG organisms and then exposed to quartz dust, while one control group was inoculated only and another was exposed to quartz dust only. Animals in the inoculated and dusted group showed no evidence of gross spreading disease up to 10 months although the tracheobronchial lymph glands steadily increased in size and firmness. At 10 months spreading foci of tuberculo-silicosis were found involving both lungs and at 13–15 months 5 deaths occurred from advanced tuberculo-silicosis, one animal showing marked cavitation Cultures were obtained from 3 of 12 tuberculo-silicotic animals and from 3 of 5 inoculated, but not dusted, animals From each of these strains 10 mgm were inoculated subcutaneously into each of four guineapigs and the progress of the infection followed for 8 months All strains were similar to the original BCG strain in

attenuation One of the animals inoculated with BCG but not dusted showed two foci of spreading tubercles in the lungs and spleen Subinoculation of organisms from this animal showed them to be as attenuated as the original BCG strain

It was concluded that BCG organisms left the intracutaneous site of injection and were carried to tracheobronchial lymph glands and lungs In the presence of quartz dust they caused a spreading and fatal disease similar to that caused by the Rl strain of human tubercle bacillus, but remained unchanged in virulence

In the second experiment, animals were infected with the BCG strain by inhalation, and were then dusted A similar progressive and fatal tuberculo-silicosis developed but did not begin to appear until 13 months after infection and deaths occurred later than in the first experiment This was thought to be due to a smaller seeding of the lungs with organisms after inhalation Animals infected with BCG only, without dusting, remained free of pulmonary disease

In the third experiment, animals were infected by inhalation after they had been exposed to quartz dust for four months previously Spreading disease became manifest at 2½ months, presumably because of the presence of silicotic lesions at the time of infection

In the fourth experiment, animals were inoculated intracutaneously with the BCG strain After 2 months a challenge dose of the Rl strain was given by inhalation, and quartz dusting was started The BCG inoculation in no way prevented or slowed the development of tuberculo-silicosis although in control animals (not dusted) BCG inoculation apparently inhibited the development of Rl infection in guinea-pigs

The authors point out that the view that BCG organisms are unable to produce progressive tuberculosis must be modified It remains to be determined whether adverse influences other than quartz or a deficient diet can produce severe disease in animals given BCG, whether similar results can be obtained with other BCG or attenuated strains, and how long BCG organisms can remain viable in the tissues In the meantime one must only interpret these results in terms of human experience with extreme caution

D A Mitchison

Vorwald, A. J , Dworski, M , Pratt, P C & Delahant, A. B **BCG Vaccination in Silicosis. II. An Experimental Study of the Influence of Inhaled Quartz Dust upon Infection by BCG (Aronson) H37Ra, and M marinum Strains of Tubercle Bacilli.** *Amer Rev Tuberculosis* 1954, May, v 69, No 5, 766-89, 24 figs. on 3 pls [30 refs.]

Having already demonstrated [this *Bulletin*, 1951, v 26, 158] that BCG organisms of the strain Rosenthal 826L could cause progressive and often fatal tuberculosis of the lungs when injected intradermally into guineapigs whose local tissue resistance had been impaired by the inhalation of quartz dust, the authors undertook further experiments to find out whether another strain of BCG, an avirulent variant of *Myco tuberculosis* H37Ra, and a strain of *Mycobacterium marinum* found in sea fishes, would produce progressive tuberculosis in guineapigs in the same conditions

Twenty-five healthy animals were infected intradermally with BCG, and immediately afterwards they were exposed to quartz dust Mantoux tests were done on 23 survivors 78 and 295 days after infection. Tuberculin conversion took place in all cases. The period of observation was 608 days Three guineapigs died from progressive tuberculo-silicosis, and autopsy examination revealed tuberculosis in 13. The disease involved the lungs in 4 cases. Tubercle bacilli were isolated by culture from the tracheobronchial glands in 12 guineapigs and from the lungs of 5 of the 16 whose lungs were thus examined

In the second experiment BCG infection was imposed upon established silicosis, exposure to quartz dust having gone on for 120 days before infection and being continued for the period of observation after infection Tuberculin conversion was seen to have occurred in the 22 animals tested Autopsy showed tuberculosis of the tracheobronchial glands in 20 guineapigs It was seen microscopically as early as 62 days after infection Pulmonary tuberculosis was subsequently found in 13 of 16 animals Tubercle bacilli were isolated from the tracheobronchial glands of 21 of 22 animals and from the lungs of 12 of the 16 examined bacteriologically

In the third experiment 24 healthy guineapigs were infected with BCG None of these animals died naturally, all were killed Progressive tuberculosis of the lungs was not found up to 608 days. Microscopic evidence of tuberculosis was found in the tracheobronchial glands of 2 The condition was regressive Positive cultures were obtained from the glands of 19 animals, at 547 days in 1 case Cultures from the lungs remained negative throughout

In experiments 4, 5 and 6 *Mycobacterium tuberculosis* H37Ra of an avirulent strain was the infecting organism It was injected into guineapigs with developing and existing silicosis and also into healthy animals In no case did the lungs or glands show evidence of tuberculosis. Tubercle bacilli were not isolated from the lungs of any of the animals studied bacteriologically but they were cultured from the glands of 11 of 65 animals all of which belonged to the group exposed to quartz dust, and 9 of the positive cultures were from animals which had been infected after being exposed to the dust for 120 days.

Similar experiments were made with *Mycobacterium marinum* as the infecting organism Tuberculin conversion was universal Tuberculosis did not occur nor were tubercle bacilli recovered from the lungs or glands. Observations were made on simple silicosis as seen in the lungs and glands of guineapigs exposed to quartz dust but not infected with the tubercle bacillus, and the histological differences between silicosis and silicotuberculosis are given in detail and illustrated by photomicrographs

*See above

SECTION V

SILICOSIS—CONTROL

Treatment—Prevention—Legal Subjects

KOELSCH Prognose und Therapie der Silikose. **[Prognosis and Therapy in Silicosis]** *Beiträge z. Silikose-Forschung* 1951, No 14, 17–24.

Prognosis in silicosis is unfavourable After a certain stage has been reached no cure can be effected Death occurs sooner or later, either due to heart failure or to complication by tuberculosis. In pneumoconiosis due to mixed dusts prognosis is slightly more favourable Progression is usually slower, the symptoms are less severe and attack rate of tuberculosis is also less

Contrary to previous knowledge a certain amount of therapeutic improvement can be achieved in cases that are not too advanced Loss of function can be improved although anatomical changes cannot be influenced The following outline of therapy is

to 6 weeks after ultrasonic treatment was begun. Further methods are inhalation of aleudrin or other

been made Strophantin is usually tried and penicillin and aludrin inhalations are given to remove bronchial spasms The author does not think that bronchial spasms are usually the main reason for disability.

Small improvements which can often be measured by the length of walks the men can tolerate are usually seen towards the end of the cure, but as a result of questionaries it appears doubtful whether

improvement. G. Nagelschmidt

SCHNEIDER. Erfahrungsbericht über die Behandlung der Silikosekranken in Bad Reichenhall **[Report on Experience Gained in the Treatment of Silicotics in Reichenhall (Spa)]** *Beiträge z Silikose-Forschung*. 1951, No 14, 25–33

This is the first report of a new centre for treatment of silicosis where a dozen patients are treated for about six weeks each Choice of patient is guided by the following principles There should be no tuberculosis, little anatomical lung change but major functional disability, the men should not be too old and there should be a reasonable prospect of their regaining or retaining capacity for gainful work

KIKUTH, W. & SCHLIPKÖTER, H. W. Staublungenerkrankungen und Verhütungsmassnahmen **[Pneumoconioses and their Prevention]** *Deut. med Woch* 1954, Feb 19, v 79, No 8, 290-93. [Numerous refs]

The article starts with a non-critical review of current thought on the origin and development of silicosis and other pneumoconioses, and stresses dust coagulation by aerosol sprays among the dust suppression techniques From this it goes on to therapy by aerosol-inhalation of electrically charged sprays of spa water from Wiesbaden, which is chiefly sodium chloride fortified by calcium and many other ions in smaller concentrations It has been found that the electric charge decreases the droplet size

Quartz powder was shaken with Wiesbaden water and after spraying was examined in the electron microscope The quartz particles were all surrounded by salt crystals After treatment with Wiesbaden water quartz had lost its capacity to adsorb colloidal silver However, in intraperitoneal animal tests the treated quartz was found to be as fibrogenic as the untreated material

Further efforts will be devoted to explaining the beneficial effect of salt inhalation sprays which has been observed It is thought possible that the individual response to dust can be influenced, for instance calcium sol may enhance phagocytosis or change the tonus of the vegetative nervous system
G Nagelschmidt

HARRISON, C. V., WRIGHT, B. M. & KING, E J. **Inhibition of Quartz-Induced Fibrosis of the Liver by Aluminium.** *J Path. & Bact.* 1950, July. v. 62, No 3, 443–4, 18 figs. on 8 pls.

Six experiments were carried out to determine the inhibitory effect of aluminium and aluminium hydroxide on the fibrogenic action of quartz. Rabbits were used, and the tested substances were given intravenously so that they should be taken up by the reticulo-endothelial system and exert their effects on the liver and spleen. Twenty doses were given over a period of ten weeks.

Quartz alone gave macrophages and giant cells full of dust at 150 days, similar foci showed reticulin at 300 days, and gross collagenous fibrous nodules at 1,000 days Control experiments with powdered aluminium alone showed macrophages but no fibrosis, and the results with commercial aluminium hydroxide (X H.1010) were essentially similar

In experiments with quartz and powdered aluminium only two animals survived 300 days, in both animals the liver showed numerous foci with macrophages and giant cells packed with dust, with a ring of reticulin, but no excess of fibrosis This result is suggestive but no more.

With quartz and aluminium hydroxide only one animal survived 775 days, the liver showed small rounded foci of macrophages containing dust, but no fibrosis. With quartz and commercial aluminium hydroxide three animals survived more than 1,000 days, and one 466 days In these animals the liver

ZEGLIO, P La profilassi medicamentosa della silicosi **[The Prevention of Silicosis by the Use of Drugs]** *Rass Med Indust* Turin 1951, Mar–June, v 20, Nos 2/3, 65–107, 19 figs [78 refs]

on the usefulness of these substances as a cure, once silicosis has occurred He refers to the drawbacks and the risks involved in the use of a product which is not pure and specially prepared for the purpose

Zeglio has devised a gel preparation of alumina which is free from acid and from other harmful impurities, and he has tried it in aerosol form, first on guineapigs and later on volunteers, and found it to be well tolerated and effective as a prophylactic against silicosis

He describes how a room can be fitted in which workmen who are exposed to the risk of silicosis in their work can be collectively given this prophylactic treatment He emphasizes that the method is intended to supplement, not to replace, other control measures which are already accepted and are being used against silicosis.

[The paper contains a mass of technical detail and those with a specialized interest in the subject will want to read it in its entirety] *J. Cauchi*

RUTTNER, J R & WILLY, W Die Gewebsreaktion auf Aluminium im Peritonealtest. **[The Effect of Aluminium in Intraperitoneal Injection Tests]** Reprinted from *Schweiz Ztschr f. Allgemeine Path u Bakt* 1953, v 16, No. 2, 216–21, 2 figs [29 refs]

This brief note describes the results of intraperitoneal tests in mice with 2 types of aluminium powder One was uncoated, the other coated with stearine Both gave X-ray diagrams of aluminium and consisted chiefly of particles below 3 μ in diameter The dosage was 5 mgm per mouse

Both dusts aggregated into deposits which were mainly cellular and showed little reticulin up to 3 months Later the deposits became acellular and collagenous, a process which appeared to be completed after 6 to 7 months There did not seem to be any marked difference between the samples

It is concluded that aluminium is a fibrogenic dust and caution should therefore be exercised in regarding it as an antidotal dust *G Nagelschmidt*

LUCHMANN, A & FISCHER, J. Die Lungensilikose und eine neue Moglichkeit der Beeinflussung ihrer Beschwerden. **[A Possible Means of relieving Severe Symptoms in Silicosis]** *Ärztl. Forschung* 1954, Oct. 10, v. 8, No. 10, I/478–I/480. [23 refs.]

After a brief review of recent theories of the pathogenesis of silicosis and procedures for the relief of symptoms the authors describe the results of the administration of a combination of drugs called *Combaludrin* (C H Boeringer Sohn, Ingelheim am Rhein) The active constituents are "Aludrin" [? Aleudrin], Buscopan, atropine sulphate, Effortil and phenylethylbarbituric acid. The proportions are stated. The first 3 components have a "broncholytic" action and Effortil improves vessel tone without causing undesirable effects on the heart and circulation, the barbiturate has a sedative action

The effect of *Combaludrin* was investigated by administration to 52 lead miners in whom silicosis was diagnosed in various stages as follows: 0–I, 29; I, 11; II and III, 8; silico-tuberculosis, 4. The duration of employment in the mines ranged from 16 to 24 years. The ore had a very high lead content

and the strata adjacent to the lode were composed of sandstone, the quartz content of which varied from 69 to 92 per cent, with sericite from 3 5 to 25 per cent Estimation of the dust showed 11-15 per cent. under 10μ. A favourable circumstance was the presence of 4-10 per cent. of moisture in the rock

The investigation with Combaludrin extended over about 5 months and applied to 48 of the miners The drug was given in 2-4 dragees per day, and was found of special value when given an hour before and during the working shift. Breathing volume, vital capacity and blood pressure were observed, as well as sputum in suspicious cases, and radiological examinations were made Daily barometric readings were recorded along with the occurrence of symptoms

The results of these observations are tabulated A disproportionately large number of patients showed low blood pressure, with subjective symptoms of weakness and lassitude, and dizziness after standing for *a time or stooping After treatment, 15 out of 25* of these patients showed improved blood pressure and symptoms; in 2 symptoms alone, and in 5 blood pressure alone were improved, and in 3 no change was observed *In 7 patients with essential hypertension* treatment with *Combaludrin* was followed in 4 by [illegible] reduction of blood [illegible] s no change was [illegible] of the favour- [illegible] severe dyspnoea of patients with advanced silicosis when the barometric readings were low Indications are given as to dosage, especially in patients with complications and *in those with severe symptoms* Further trials and observations are necessary to estimate the possible value of *Combaludrin* in the treatment of severe symptoms in patients with silicosis, and in delaying the *development of the disease* *E L Middleton*

RAULE, A & GRISLER, R Primi risultati clinici ottenuti nella *silico-tubercolosi mediante trattamento* con dosi massive di propionato di testosterone **[Clinical Results of Treatment of Silico-Tuberculosis with Massive Doses of Testosterone Propionate]** *Med d Lavoro* 1952, Jan, v 43, No 1, 4-8 [11 refs] English summary

Eight patients with silicosis accompanied by active, [illegible] and four patients with active, [illegible]

[illegible] after cessation of *the treatment*, are set out [illegible] In all the 12 patients there was a subjective improvement in strength and appetite; objectively, the weight was increased in 11 patients, and the haemoglobin level was raised in 10 patients. In none was there observed a favourable *alteration in the erythrocyte* sedimentation rate, or in the pyrexia which was present in 3 patients, and no improvement was noted on the chest radiographs or on the presence of tubercle bacilli in the sputum *These results confirm* a favourable influence of testosterone on the general condition in pulmonary tuberculosis, even when it is associated with silicosis *E. L Middleton*

ZOLLNER, N, BRAUN, Gertrud & KARL, O Die Wirkung der Inhalation eines Tetracyclins auf den Atemgrenzwert von Silikosekranken **[The Effect of the Inhalation of a Tetracycline on the *Pulmonary* Ventilation *in* Cases of *Silicosis*]** *Klin. Woch* 1955, Aug 1, v. 33, Nos 29/30, 722-4 [12 refs]

The subjects of this examination were 8 workers, aged between 55 and 67 years, who had acquired silicosis through the inhalation of porcelain dust *All had been invalided for months or years* and in none of them was there any sign of tuberculous infection Their pulmonary efficiency was determined by means [illegible] before during and *after* [illegible] in aerosol [illegible] ssive days [illegible] te increase [illegible] *he increase* [illegible] *Delafield*

RAYMOND, V Prévention de la silicose (Résultats de la Conférence de Sydney.) **[Prevention of Silicosis. Results of the Sydney Conference]** *Arch. Malad. Professionnelles.* Paris 1952, v 13, No 1, 42-7

This is a short statement on some of the points [illegible] held [illegible] tional [illegible]

Recent work on the effective size range of inhaled dust particles tended to lower the upper limit from [illegible] 3μ; *Hatch* [illegible] deposited in [illegible] percentage of [illegible] it reached a [illegible] *wards 0 25μ.* [illegible] led particles [illegible] erto it had [illegible] re not to be found in the tissues, but they could be *seen in* lung *sections with the electron* microscope. By a new series of experiments with the electron microscope, Hatch has demonstrated a second curve *in the frequency of retained particles, commencing* at 0 25μ, reaching a maximum at 1 0μ and falling again towards 0 013μ, he attributed the alveolar *retention*

of ultra-microscopic particles to brownian movement. The pathogenic action of these ultra-fine particles was not clearly understood VORWALD and his co-workers at Saranac Lake carried out inhalation experiments on rabbits with particles in the size range 0 04–0 005μ and obtained a rapid response characterized by diffuse cellular reaction. Rats exposed to inhalation of silica particles in a size range 0 36–0 008μ, in an average concentration of 0 25 gramme per cubic metre of air showed at the end of ...

... references were made to the recorded observations of VIGLIANI and ...

... to free silica derived from bauxite in the furnace processes of manufacture of aluminous abrasives, recorded by SHAVER and † RIDDELL [*ibid*, 1947, v 22, 643] and by JEPHCOTT, and to the change of kaolin to mullite under the influence of heat The evidence on the ... called inert d... was reviewed ... was discussed ... ference indica... lacking ... of ... ba... pe... in ... du... me... aluminium aggravated pulmonary tuberculosis

E L Middleton

LANGE, Fritz [Edited by] Bekampfung der Silikose Forschungsarbeiten [Control of Silicosis. Research Work] 126 pp, numerous figs 1955 Essen Glückauf G m b H, Postschliessfach 279 [DM 12]

This is a report of a conference held in the coal mining district of ... which scie... discussed ... the means ... representa... Munster ... and Essen in the activities of which the scientific study of silicosis in all its aspects formed an important part. The report contains contributions from scientific representatives and a record of the discussion.

F. LANGE, Mining Assessor, the editor of this report ...

... what had taken place since the previous meeting nearly 2 years before, especially the work done on aerosols in treatment and prophylaxis He referred to the international importance of silicosis, a term ...

... was almost double that of the fatalities from accidents, in the year 1952 it was 3 times as great In 1953 deaths from silicosis were 1,564, compared with 687 from accidents A trend to later ages was noted in silicosis deaths. Reference was made to the bad effect of mouth breathing, when drilling in mines the worker soon finds the nasal passages encrusted with dust, thus, with strenuous exertion mouth breathing becomes necessary Adequate support for the drills relieves exertion and thereby acts as a means of controlling silicosis

The next subject dealt with was *Control of Dust Underground* This was presented under 4 heads ...

... fresh-air supply and collection of the dust, the use of fine water sprays at loading points, enclosure of machines in casings provided with exhaust draught, and, finally, water infusion under pressure into the coal face Fixation of deposited dust is secured by spreading common salt in quantities of 20-25 kgm per square metre which provides a depth of about 3 cm, the surface is lightly sprinkled with water so that the surface layer is dissolved and penetrates the layer of dust, binding it and forming a dust-free layer, the process is repeated at regular intervals Stowage of rubbish by hand is rarely used now and various methods of mechanical handling are used with conveyor belts and strippers guiding the waste as required Personal protection against dust is provided in situations where mechanical means cannot be applied, for light work a simple filter-mask can be worn, but for heavy work breathing-apparatus with independent fresh air supply is provided; great improvements have been made in equipment for personal protection in recent years ...

of particles of coal and stone are taken with the konimeter; samples are taken at intervals of 8–12 weeks. The data are entered on one card which represents personal particulars, the employment of each man, and the dust concentrations and compositions at his workplaces The records will show the dust exposures over a period of about 3 years, and improvements in the dust control can be measured.

Therapeutic and Prophylactic Measures in the Control of Silicosis. In this section the use of aerosols is described, both in treatment of workers and patients in the special rooms provided at the pit-head, and for suppression of airborne dust underground. In August 1950 an inhalation room was installed at Hannibal mine, the first in the Ruhr mines to adopt the new treatment by aerosols of warm-spring water with an electrical charge This installation and procedure have been described before in published papers, but here the illustrations and brief description give an outline of the method of administering calcium-containing brine in an atomized spray to the workers and patients seated in the specially designed rooms An electrical charge is given to the liquid by means of a metal net suspended near the ceiling and a coil connected with the nozzles which deliver the spray by compressed-air into the homogeneous electrical field Following good results at Hannibal mine an installation was made, at Hanover mine in December 1951, of a large inhalation corridor in which miners can receive treatment in proceeding to and returning from the working shifts In 1952 rooms were installed for treatment of patients and their families. In 3½ years, to 1954, 10,639 patients had been treated at the "inhalatorium" at Hannibal, for silicosis, whooping cough, bronchitis and asthma All the patients were benefited in symptoms and general well-being. No ill effects have been observed Many mines and industrial undertakings have followed this example A period of 5–10 years will be necessary for the observation of results to determine whether it is useful for alleviation of symptoms only or is a remedy for dust diseases of the lungs

The Use of Aerosols Underground was introduced with the aim of aggregation and precipitation of particles of dust, the smaller particles tending to adhere to the larger ones Four types of apparatus [illegible] these are [illegible] was also [illegible] lation by [illegible]

New Information on the Additional Charge on Aerosols is the next subject discussed. Results of investigations carried out by SCHLIPKÖTER, BERGHAUS and JUNGE, CAUER and others are summarized This contains much detail on examinations of aerosols, their [illegible] and therapeutic action [illegible] further [illegible] ler way [illegible] ork and

Animal Experiments on Aerosol Inhalation and the Occupational Use of Aerosols at the Hanover and Hannibal Mines After tracing the development and use of aerosols in medical and physical studies a description is given of the laboratories at Hannibal mine. They include a physical laboratory for measurement of dust particles and of the electrical charge of aerosols; a laboratory for microchemical analysis of aerosols and dusts; a room for experiments on the biological actions of unipolar charged aerosols on normal persons and silicotics, a room for observation of animals with artificially induced silicosis treated with calcium-brine aerosols with and without an electrical charge, and a separate room for control animals with silicosis but without inhalation treatment. A large room is used for testing apparatus for aerosol production underground in mines, and facilities are provided for the study of mine air, and the clumping effect of aerosols on airborne dust, and for counting and measurement of particles, and the further development of apparatus From the chemical and physical investigations information is obtained for developing the production and use of aerosols and determining the most effective sizes of the aerosol cloud, [illegible] of the w[illegible] various n[illegible] aerosols in treatment of silicosis are discussed The electrical *charge on aerosols containing* sea water reduced the humidity in the inhalation room so that patients' clothing remained practically dry. *Natural* spring waters were tested for therapeutic value Animal experiments were carried out, in Munster, on rats by intratracheal injection of quartz and administration of aerosols with and without electrical charge; this investigation is not yet completed; similar tests made at Bochum showed that control rats had slightly shorter lives than those treated with aerosols

The Economic and Social Importance of Silicosis in Mining shows the actual costs, over the years from 1929 to 1953, in compensation and pensions for dust diseases of the lungs, and the expenditure on preventive measures per ton of coal mined in German coalmines

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H W. SCHLIPKÖTER presented a *Report on New Results of Research at the Institut fur Hygiene und Mikrobiologie, Düsseldorf* A method is described for making extremely fine sections, of 0 1 μ thickness, of silicotic tissue with an ultramicrotome, and examining them with the electron microscope and taking photographs; after many difficulties had been overcome over 1,000 pictures were made, and 18 of these are reproduced, at magnifications up to over 32,000 diameters The investigations included histological examination of silicotic granulomata from experimental animals and from a human case of silicosis Changes similar to those in the granulomata in the animals were observed in the pathological tissues in the human lungs At least 3 different kinds of plasma particles were distinguished near the alveoli, these are described Quartz particles in the centre of the *necrotic zone of the granuloma, and collagen fibrils* are shown at magnifications of 32,700 diameters It is conceivable that the crystalline-free silicic acid in contact with the cells has a destructive action on the cytoplasm particles, it is, however, also possible that the surface of quartz crystals with their special structure causes the damage, the final changes in the cells and the reaction products are for biochemical study to determine The electronoptical work for this interesting study was carried out at the Rhenisch-Westfalischen Institut für Übermikroskopie

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The last 2 papers were mathematical studies contributed by H STEIGER, physicist at the Research Institute of the Hannover-Hannibal Coal Company of Bochum-Hordel. *The first of these is on Graphic Presentation of Measurements of Particle-Sizes from Aerosol Generators* The particles were collected by [illegible] centages of all those counted and presented in the [illegible] of particles by gravity, brownian movement, and *movement of charged particles in an electrical field*

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E L Middleton

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A general lecture in which the following points are made Silicosis compensation in Switzerland costs several times more than all other occupational diseases *Silicosis research is organized in the* Zurich and Lausanne Groups [illegible] accounted for one-quarter and various other disabilities for the rest There is a right of appeal and in 63 cases appeals were made, the ruling of the Institute was upheld in 60 of these

There is now a tendency to leave men with slowly developing silicosis and few clinical signs to continue in such dust work as slate work, ceramics and foundry work. If a change of work is requested, a temporary benefit is given but in the absence of disability or clinical signs, no permanent compensation is paid.

Protective dusts and aerosols are not used. Medical prophylaxis should be considered as a necessary evil. The main protection should come from dust suppression *G. Nagelschmidt*

BREIDENBACH, F. Zum Problem der Silikoseverhütung durch Kaumittel **[Can Chewing prevent Silicosis?]** *Beiträge z. Silikose-Forschung* 1954, No. 29, 53-64, 5 charts & 1 fig. [21 refs]

of particles of coal and stone are taken with the konimeter; samples are taken at intervals of 8–12 weeks The data are entered on one card which represents personal particulars, the employment of each man, and the dust concentrations and compositions at his workplaces The records will show the dust exposures over a period of about 3 years, and improvements in the dust control can be measured

Therapeutic and Prophylactic Measures in the Control of Silicosis In this section the use of aerosols is described, both in treatment of workers and patients in the special rooms provided at the pit-head, and for suppression of airborne dust underground. In August 1950 an inhalation room was installed at Hannibal mine, the first in the Ruhr mines to adopt the new treatment by aerosols of warm-spring water with an electrical charge. This installation and procedure have been described before in published papers, but here the illustrations and brief description give an outline of the method of administering calcium-containing brine in an atomized spray to the workers and patients seated in the specially designed rooms An electrical charge is given to the liquid by means of a metal net suspended near the ceiling and a coil connected with the nozzles which deliver the spray by compressed-air into the homogeneous electrical field Following good results at Hannibal mine an installation was made, at Hanover mine in December 1951, of a large inhalation corridor in which miners can receive treatment in proceeding to and returning from the working shifts In 1952 rooms were installed for treatment of patients and their families. In 3½ years, to 1954, 10,639 patients had been treated at the "inhalatorium" at Hannibal, for silicosis, whooping cough, bronchitis and asthma All the patients were benefited in symptoms and general well-being No ill effects have been observed. Many mines and industrial undertakings have followed this example A period of 5–10 years will be necessary for the observation of results to determine whether it is useful for alleviation of symptoms only or is a remedy for dust diseases of the lungs

The Use of Aerosols Underground was introduced with the aim of aggregation and precipitation of particles of dust, the smaller particles tending to adhere to the larger ones Four types of apparatus were used to produce aerosols underground, these are described and illustrated An apparatus was also devised for producing aerosols for inhalation by workers during the shift underground.

New Information on the Additional Charge on Aerosols is the next subject discussed. Results of investigations carried out by SCHLIPKÖTER, BERGHAUS and JUNGE, CAUER and others are summarized This contains much detail on examinations of aerosols, their physical characters, biological and therapeutic action This should be studied by those interested; further studies, including animal experiments, are under way

The next section deals with *Research Work and Animal Experiments on Aerosol Inhalation and the Occupational Use of Aerosols at the Hanover and Hannibal Mines.* After tracing the development and use of aerosols in medical and physical studies a description is given of the laboratories at Hannibal mine. They include a physical laboratory for measurement of dust particles and of the electrical charge of aerosols; a laboratory for microchemical analysis of aerosols and dusts; a room for experiments on the biological actions of unipolar charged aerosols on normal persons and silicotics, a room for observation of animals with artificially induced silicosis treated with calcium-brine aerosols with and without an electrical charge, and a separate room for control animals with silicosis but without inhalation treatment A large room is used for testing apparatus for aerosol production underground in mines, facilities are provided for the study of mine air, the clumping effect of aerosols on airborne dust, for counting and measurement of particles, and further development of apparatus From the chem and physical investigations information is obtai for developing the production and use of aero and determining the most effective sizes of the ae sol cloud, the electrical charge, and the saline conte of the water used. The chemical composition various natural waters and their possible value aerosols in treatment of silicosis are discussed Th electrical charge on aerosols containing sea-wate reduced the humidity in the inhalation room so that patients' clothing remained practically dry. Natural spring waters were tested for therapeutic value Animal experiments were carried out, in Munster, on rats by intratracheal injection of quartz and administration of aerosols with and without electrical charge, this investigation is not yet completed; similar tests made at Bochum showed that control rats had slightly shorter lives than those treated with aerosols

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The last 2 papers were mathematical studies contributed by H. STEIGER, physicist at the Research Institute of the Hannover-Hannibal Coal Company of Bochum-Hordel. The first of these is on *Graphic Presentation of Measurements of Particle-Sizes from Aerosol Generators*. The particles were collected by sedimentation, thermal- or electrical-precipitation, or by konimeter; the light-field microscope was chiefly used for counting, the smallest diameters measured being about 1 μ; by dark-field, particles down to 0.1–0.2 μ are seen. The magnification is selected so that a line in the ocular micrometer corresponds to about 1 μ or more; the particle sizes are classified as percentages of all those counted and presented in the form of tables, curves or columns; examples of curves plotted on linear and logarithmic paper are shown. The second paper is on *The Physical Behaviour of Aerosol Particles*, in which are studied the movements of particles by gravity, brownian movement, and movement of charged particles in an electrical field.

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A general lecture in which the following points are made. Silicosis compensation in Switzerland costs several times more than all other occupational diseases. Silicosis research is organized in the Zurich and Lausanne Groups.

No specialists are required for pre-employment or control medical examination, but all results of examinations and all X-rays are filed and scrutinized at a central Institute (SUVA). During the last 7 years 22,000 persons were examined and 7.6 per cent. found to be unsuitable for dust work; nearly half the people found unsuitable were silicotics, tuberculosis accounted for one-quarter and various other disabilities for the rest. There is a right of appeal and in 63 cases appeals were made, the ruling of the Institute was upheld in 60 of these.

There is now a tendency to leave men with slowly developing silicosis and few clinical signs to continue in such dust work as slate work, ceramics and foundry work. If a change of work is requested, a temporary benefit is given but in the absence of disability or clinical signs, no permanent compensation is paid.

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employer or an employee challenge a decision as to the presence of silicosis or tuberculosis the matter will be referred to the Silicosis Medical Bureau of South Africa acting as a Medical Board of Appeal who may require the person concerned to go to Johannesburg for examination. *E. L. Middleton*

STAUB Dusseldorf. 1952, Mar 15, No. 28, 1–7. *Verordnung zum Schutze der Staublungenerkrankungen (Silikose) in der keramischen Industrie* Vom 1 September 1951. **[Order for the Control of Pneumoconiosis (Silicosis) in the Ceramic Industries]**

This is the full text of a new law issued in September, 1951, *for silicosis control in the ceramic* and refractories industries in Germany. It only lays down general principles of dust control, such as minimum working space, room height, isolation of dust-producing processes, etc. But a number of specific rules are made about initial and periodical medical examination of all workers exposed to a dust ha[illegible]
women,
facilities
forth.
issued for the mining industry.

The employers are responsible for keeping records of every person engaged in a dust hazard, for seeing that the medical examinations are carried out (by specially licensed doctors only) and for carrying the cost of these examinations, unless the *Berufsgenossenschaft* (The Industrial Insurance carrier) pays these.

An explanatory note says that on account of the war *following on many years of depression, buildings* and installations in the ceramic industries are often out of date and not up to modern requirements in industrial hygiene. The hope is expressed that the above order will go a long way towards suppressing silicosis in the ceramic industries.

G. Nagelschmidt

STAUB Dusseldorf 1952, Mar. 15, No 28, 8–14 Richtlinien über den Schutz gegen gesundheitsgefährlichen Staub zur Abwehr von Lungenerkrankungen **[Regulations for the Control of Dust which may cause Respiratory Disease in the Ceramic and Glass Industries]**

These regulations, which were issued in August, 1950, give very detailed technical instructions about dust control The materials considered specially dangerous are free silica, asbestos, manganese compounds and basic slag, and any products that may contain any of them, including glazes, enamels, foundry sands, *cleaning powders, etc*

The employment of juveniles except as *trainees is* forbidden and there are many safeguards against employing people *considered unsuitable for* other reasons

The regulations are too detailed to be reviewed adequately. New buildings should have a minimum room height of 3 5 metres (10 ft. 6 in) and a minimum of 15 cub m (420 cub ft) [illegible]

[The regulations, which are issued by the *Berufsgenossenschaft, do not mention dust measurements,* and no dust standards are laid down]

G Nagelschmidt

STAUB Dusseldorf. 1952, June 15, No 29, 128–38 [illegible]

These regulations, which are enforceable by law, deal with all processes in the quarrying and allied industries, in workshops and underground, in great detail Materials which may give rise to dangerous dust are defined, and the employment of certain classes of people is prohibited. Initial and periodical medical examination is not generally compulsory but can be demanded by the *Berufsgenossenschaft* (insurance carrier for a given industry) Separate chapters deal with new installations, dust control in [illegible]

G Nagelschmidt

GLAESER, O. A. **Compensation for Lung Changes due to the Inhalation of Silica Dust.** *Arch Indust Hyg. & Occupational Med* Chicago 1950, July, v. 2, No. 1, 56–62

Consideration is given to the working in the State of Utah of the Occupational Disease Disability Law, particularly with reference to lung diseases The law was recently modified in the State of Utah to cover partial disability. On the recent cessation of mining activities 16 claims were filed A commission was directed to examine this group of applic- [illegible] 4 were found to
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German silicosis legislation was changed recently. According to the new regulations silicosis need no longer be "advanced" (*schwer*) in order to qualify for compensation, but a measurable reduction of cardio-respiratory function due to silicosis must be demonstrable Other heart diseases, especially coronary sclerosis and hypertony, are increasing in the general working population and the demonstration that a change in heart function is due to silicosis (chronic cor pulmonale) may be very difficult The simple electrocardiographic techniques used previously are not adequate and special techniques are discussed, the use of chest wall leads is especially recommended *G. Nagelschmidt*

FROST, J & GEORG, J **The Clinical Evaluation of Disability in Silicosis.** *Acta Med Scandinavica* 1953, Dec 30, v 147, No 4, 349–57, 3 figs [34 refs.]

No co-relation in cases of silicosis has been established between the X-ray picture, the symptoms experienced and the degree of disability In order to re-examine the position, clinical examinations and measurements of pulmonary function were carried out on 50 cases of silicosis (from among whom patients with tuberculosis, cardiac diseases, or high blood pressure were excluded) X-ray films were taken, and fluoroscopic examinations were made of diaphragmatic movements, electrocardiograms were made Vital, residual and total capacity of the lungs, together with maximum breathing capacity, were measured, and a special working test on a bicycle-ergometer was made

The cases were grouped into 3 stages of silicosis When the observations were analysed a significant difference was noted between the total capacity for stage 3 and stage 1, and the same held good for vital capacity and maximum breathing capacity, but differences between stage 2 and stage 1 were insignificant The relations between total lung volume and X-ray stages of silicosis showed a rough parallelism Pulmonary emphysema, as indicated by expressing the residual capacity as a percentage of the total lung volume, showed a similar relation Advanced emphysema was present only in stage 1 and 2 silicosis No obvious correlation was found to exist between X-ray stages of silicosis and the subject's working capacity Compensation should not be assessed purely on X-ray findings *E. L. Collis*

DESOILLE Droit des silicotiques à l'indemnité journalière et aux soins Une décision de la commission de première instance de Paris **[Claim of Silicotics to Short-Term Compensation and Care. A Decision of the "*Commission de Première Instance*" in Paris]** *Arch Malad Professionnelles.* Paris 1952, v. 13, No. 5, 485–6

DESOILLE, H, GAULTIER, M & HADENGUE, A Problèmes et difficultés pratiques soulevés par la réparation de la silicose **[Problems and Practical Difficulties met with in giving Compensation for Silicosis]** *Arch Malad Professionnelles* Paris 1954, v 15, No 6, 485–92

In France a number of decrees govern the application of compensation to silicosis, the law of October 30, 1946, was modified in its application by a decree of November 17, 1947, which in its turn was altered by a decree of October 18, 1952, and by another of November 23, 1953 The results from applying the texts of these ordinances are far from being always satisfactory The first difficulty is in fixing exactly when the illness started, for which a local doctor may have to be the deciding authority, although he may have no expert knowledge and may have no information as to the legal position. The patient may have changed his work and be no longer exposed to the silica hazard Much time often elapses before the appointed medical expert upon pneumoconiosis is called upon to decide upon the case No certainty exists that the dossier of the case will contain all the requisite information concerning the clinical state, the radiology, sputum examination and functional capacity or disability Further, the expert on pneumoconioses may not have at his disposal the requisite apparatus needed for clinical appraisal, X-ray, and determination of functional capacity Meanwhile the patient, undergoing numerous examinations of which he understands nothing, becomes silicosis-conscious

the pneumoconiosis experts and a central mission in Paris where dossiers on silicosis should be kept under the supervision of an acknowledged expert Particular attention is directed to the decree which insists upon the holding of autopsies to confirm the findings made during life *E L Collis*

MICHAUX, P Problèmes posés par la réparation de la silicose en Algérie **[Problems presented by giving Compensation for Silicosis in Algeria]** *Arch Malad Professionnelles* Paris 1954, v 15, No 6, 492–4

Although there are no official records of silicosis occurring in Algeria, *the occupational hazard exists* and will increase as industry goes on expanding More *and more pneumatic drills are coming into use* in mining, in making barrages for reservoirs, and hydro-electric plants, and similar processes, which generate dangerous dust. The legislation which deals with silicosis in France, complex though it is and difficult to apply, does not run in Algiers Moreover, there are no accepted industrial experts on industrial pneumoconioses to whom difficult cases can be referred The patient goes to his doctor with dyspnoea and cough, and then, if shadows are seen on X-ray, a diagnosis of tuberculosis is made Later the authority for making sick allowances may come to hear of the illness having an occupational origin Payment is then suspended until the question of who must pay has been decided The compensation is governed by the provisions of accident insurance and the disease has to be declared an industrial accident A chemical and a geological expert may be called in to decide the nature of rocks drilled Prevention is frequently determined by the outgoing cost of compensation There is great need for adjusting compensation for silicosis in Algeria *E L Collis*

DARDENNE, P, BARRÈRE, A. & FABRE, A. Aperçu sur la silicose dans la région toulousaine **[Silicosis as it occurs in the Neighbourhood of Toulouse]** *Arch Malad. Professionnelles.* Paris 1952, v. 13, No 6, 533–40

The authors are mainly concerned in discussing *administrative* difficulties in putting into force regulations concerning the granting of compensation to men afflicted with industrial silicosis. Their observa- [illegible]

[illegible]

of silicosis as being due to the inhalation of the dust [illegible]

opal and crystals of quartz, or the silicate talc which may contain quartz in excess Some applications were refused because the exposure-time was less than 2 years. Other cases evolving after the occupational exposure had ceased also raised difficulties Then 12 per cent. were rejected owing to differences in medical diagnoses and opinions as to the interpretation of X-ray appearances A few cases came from other [illegible] ere [illegible] red [illegible] led [illegible] out high on the mountain-sides in galleries often imperfectly ventilated after the explosion of charges to bring down the rocks About 18 per cent of the subjects had tuberculosis Strain on the right heart was n[illegible] seen often among the miners In future the dossie[illegible] will gain from containing data accruing from syst[illegible]matic periodic examinations with X-ray films.

E L Collis

PNEUMOCONIOSIS DUE TO SILICATES

Asbestos. Aetiology—Pathology—Radiology—Clinical Findings—Complications
Other Silicates: Kaolin—Talc—Mica—Fuller's Earth (Montmorillonite)—Feldspar—Sepiolite

VORWALD, A J, DURKAN, T M & PRATT, P C **Experimental Studies of Asbestosis.** *Arch Indust Hyg & Occupational Med* Chicago 1951, Jan., v 3, No 1, 1–43, 13 figs [Refs in footnotes]

The findings are here summarized of many years of research inaugurated by the late L U GARDNER at Saranac Much light is thrown upon the damage done to the lungs by inhaled particles of asbestos, which occurs in a number of minerals, all silicates varying in composition and composed of long, parallel, flexible fibres, capable of repeated longitudinal subdivision to units of molecular proportions The commonest form is chrysolite, found in veins up to 6 inches in depth, occurring in deposits of serpentine Guineapigs, rats, mice, rabbits, and dogs received dust particles of asbestos either by inhalation, or by injection intratracheally, intravenously or intraperitoneally Three forms of dust were used, (*a*) ordinary industrial dust, (b) ground dust of which the particles were 3 microns or less in size, and (c) long fibres from which the small particles had been separated Both (a) and (c), and especially (c), originated characteristic peribronchiolar fibrosis which did not increase after the dust exposure was discontinued, if the animals were infected with attenuated tubercle bacilli, a temporary progression of the infection occurred, followed by subsequent healing, very different from the rapid progress of the infection in cases of silicosis When the asbestos dust particles were 3 microns or less in size, there was little or no reaction of the living tissues to their presence, here again is a great change from the reactions to silica dust, which are greater as the dust particles become smaller This difference supports the idea that the reaction to pulmonary reaction was due to irritation found [illegible]

upon which have been deposited organic material rendering them innocuous, when such bodies were used alone no fibrotic reactions were induced Dust of aluminium hyroxide, held to render silica dust innocuous, was not found to exert any influence upon asbestos fibres Excellent illustrations of microscopic appearances support the conclusions drawn, and extensive tables contain experimental findings

A further report is promised which will be concerned with human asbestosis *E L Collis*

BEH[illegible]

[illegible]

causation is complex since asbestos used in industry is not a pure chemical substance but is a mixture of chrysolite-asbestos and horn blende asbestos, compounds which differ in their chemical and physical characters

In the experiments here described in some detail, a pure chrysolite asbestos was used and the effects of its introduction, intraperitoneally into mice and intratracheally into rats, were studied The unsuccessful attempts to secure fibres of standard length are described The fibres used in these experiments ranged from 5 0μ to 180 0μ in length, [illegible]

action of the asbestos could be demonstrated. Asbestosis bodies were not formed. These bodies are regarded by the author as products of a non-specific reaction of certain tissues, to long-fibred foreign bodies, and are considered not to have any significance in the genesis of asbestosis.

M. E. Delafield

CHAMPEIX, J & BOUTEVILLE, J Étude au microscope électronique des corps asbestosiques et des fibres d'amiante. **[A Study with the Electron Microscope of "Asbestos Bodies" and of Fibres of Asbestos]** *Arch. Malad Professionnelles.* Paris. 1950, v. 11, No 6, 607–12, 7 figs.

An attempt has been made, by using the electron

ordinary microscope, but by using cathode rays it is possible to obtain magnifications of the order of 50,000. Chrysolite is the form of asbestos most used

of that kind coated with a collar of colloidal gel,

pneumonic fibrosis of asbestosis is a mechanical phenomenon, provoked by particles of amosite which is the other and more resistant form of asbestos, or whether it is a chemical phenomenon, provoked by the absorption of chrysolite. *E. L. Collis*

RÜTTNER, J. R Über Asbestose- und Pseudoasbestosekorperchen. **[Asbestosis Bodies and Pseudo-Asbestosis Bodies]** Reprinted from *Schweiz Ztschr. f Allgemeine Path. u Bakt.* 1952, v 15, No 5, 628–31 [12 refs]

The literature on asbestosis bodies is reviewed Similar products were found by the author in a lung which only contained carborundum and graphite, the bodies were formed around plates and needles of carborundum The protein and iron which form the bulk of the "bodies" must come from the lung tissues and not from the mineral matter of the dust. Similar bodies could also be produced *in vitro* but they have not so far been found in animal experiments. *G Nagelschmidt*

KNOX, J. F. & BEATTIE, J. **Mineral Content of the Lungs after Exposure to Asbestos Dust.** *Arch. Indust. Hyg. & Occupational Med* Chicago. 1954, July, v. 10, No 1, Sect. 1, 23–9

A study was made of the content in asbestos of 27 lungs from persons who had been exposed for varying periods and to varying amounts of asbestos dust during life The lungs had been collected over 4 years. The identification of the mineral constituents of the ash obtained from the incineration of the lungs is presented Opinions as to the pathological condition of the lungs were always compared with the mineral findings Hilar tissue and tissue from the pleural

and death—was an important factor.

Asbestos fibres are removed from the lung parenchyma mostly by macrophages carrying them to the pleural surfaces and the glands, some may be absorbed in the body fluids—indeed, those undergoing such absorption may form the "asbestosis bodies". The amount of material under examination was not large

lengthening of the combined exposure and survival times, and not with increasing mineral content No severe case of asbestosis occurred in persons with less than 29 years' exposure to dust, but all persons with such long exposure did develop severe asbestosis. *Asbestos dust was cleared away relatively slowly, much* more slowly than it was inhaled The products of disintegration of asbestos bodies are a relevant pathogenic factor; it is a slow process and may take several decades On removal from dusty conditions the fibrotic changes do not progress, but tend to regress

The findings suggest that the onset of asbestosis is *not determined by the absolute amount of mineral* present in the lung parenchyma, but is related to changes occurring in the inhaled material after a time

Collis

KNOX, J F. & BEATTIE, J. **Distribution of Mineral Particles and Fibers in the Lung after Exposure to Asbestos Dust.** *Arch Indust Hyg & Occupational Med* Chicago 1954, July, v. 10, No 1, Sect 1, 30–36, 3 charts

The particle-size distributions in the incombustible and insoluble residues from the lungs of 27 persons who had been exposed to asbestos dust were determined. The material was the same as that used in the previous work [see above]

The number of particles with a greatest length in [illegible]

in the ranges of 5 microns and less and of 5 to 15 microns The suggestion emerges that long fibres of asbestos are attacked and converted in the parenchyma of the lungs into asbestos bodies and then into small particles This breakdown is associated with severe fibrotic changes in the lungs The product that exerts this fibrogenic effect is unknown Anything which blocks lymphatic drainage will assist its action

E. L Collis

LYNCH, K M. **Pathology of Asbestosis.** *Arch Indust. Health* Chicago 1955, Mar, v 11, No. 3, 185–8, 4 figs

In contrast to silicosis which is generally accepted to be a chemical reaction between the pulmonary tissues and fine particulate silica dust, asbestosis is considered to be a physical reaction between relatively large asbestos fragments and the lung tissue Free silica is held to be chemically poisonous to living [illegible]

clinicians detect an increase of lung fluid, but no fibrosis, only "ground-glass" X-ray shadows Grade 2 *is not grossly abnormal, but alveolar walls thicken* and perivascular fibrosis appears So far freedom from dust exposure permits entire recovery Grade 3 is marked by dyspnoea, the lung being of coarsely honeycomb fibrous texture Cessation of exposure *may halt further progress, but the condition will remain in statu quo ante* In grade 4 the patient finally becomes absolutely disabled as regards respiratory and circulatory functions Pleural fibrosis is not invariable [No similar reaction caused by any other chemically inert dust is quoted in support of this physical reaction to asbestos dusts] *E L Collis*

RAMASWAMY, A S, VENKATESH, D S & RAMA RAO, R **The Nature of Lesions caused by Asbestos and Mica in Experimental Pneumokoniosis in Guinea-Pigs** *J Indian Inst Sci* 1953, Oct, v 35, No 4, 319–31 (Sect A), 2 text figs & 15 figs on 4 pls [38 refs]

In order to elucidate some of the puzzles connected with the production of silicosis a series of experiments was undertaken by subjecting guineapigs to intra- [illegible]

found to lead to some degree of nodular formation in the lungs, but the asbestos dust set up diffuse fibrosis only *These differences are portrayed in a series of* [illegible]

zona fasciculata and zona reticulata.

A discussion of some interest follows, in which the atomic structure of asbestos and mica is illustrated, and accumulated evidence is claimed to show that the [illegible]

as indeed it must—to form the scar tissue which becomes fibrous and pathological is not clearly set forth; nor is any suggestion made why the whorled *fibrosis of silicosis is so bound up with tuberculous* infection, whereas the more diffuse fibrosis of asbestosis is less associated with the infection, and the minor nodular fibrosis of mica has no such tendency. That miners exposed to mica and asbestos dusts experience anorexia, weakness, loss of weight and extreme prostration may be ascribed to the damage to the adrenal glands Still we are left wondering how a dynamic interplay of hormone secretion is determined by the physio-chemical properties of the minerals *E L Collis*

KRAUSLER, J & SEYSS, R Zur Fruhdiagnose der Asbestosen mittels Vergrosserungsaufnahmen **[Early Diagnosis of Asbestosis by Enlarged Radiographs]** *Ztschr f Unfallmed u Berufskrankh* 1954, Mar 15, v 47, No 1, 59–64, 2 figs on 2 pls [15 refs]

After a brief description of asbestosis and the changes in the lung tissue found in the early stages of the disease the authors describe a radiographic technique with a fine focus, in which Muller-Philips apparatus D A 400 is used, and an exposure time of 0 2 second Of 17 asbestos workers, with employments varying in duration from 1 to 18 years, 8 showed changes in the lung tissues by radiography with the enlargement technique, 2 of these showed no change by normal technique, and in the 6 other cases the degree of change shown was minimal Photographic reproductions of the radiographs of the least affected worker, with 7 years' exposure, show the more marked findings with the enlargement technique

E L Middleton

BOHME, A Ergebnisse von Nachuntersuchungen bei Arbeitern einer Asbestfabrik **[Results of Periodical Examinations of Workers in an Asbestos Factory]** *Beiträge z Silikose Forschung.* 1951, No. 11, 27–34

Radiological supervision in an asbestos factory started in 1936 Labour turnover was rapid, women chiefly being employed and only a small nucleus o

workers of either sex had more than 10 years' exposure. The average labour force was 200 but during the war it was more. X-ray changes were first seen in rare cases after 2½ to 3 years of work,

to the number of people examined.

Years at work	1936	1940	1949
2–5	13 (38)	8 (51)	3 (33)
5–10	58 (26)	50 (10)	36 (11)
Over 10 . ..	77 (9)	80 (10)	58 (31)

Stage 3 asbestosis is very rare, three cases only being seen between 1940 and 1949.

A comparison of different working places shows that the risk is low in spinning and weaving but high in preparation, carding and brake polishing. A table shows results for 14 cases from 1936 to 1949. Some progressed, others did not. Enquiries among former workers reveal little if any tendency to progression after the dust exposure has ceased. This is in contrast to silicosis. On the other hand a personal factor exists, as in silicosis, as a number of workers do not get asbestosis in spite of high dust exposures.

Progressive tuberculosis is rare, only two cases being found, both started in the parts of the lung least affected by asbestosis. One combination of asbestosis and carcinoma of the lung was found.

The main result of this study is the demonstration that the hazard can be reduced by dust control.

G. Nagelschmidt

SANDER, O. A. **Asbestosis as differentiated from other Pneumoconioses.** *Arch. Indust. Health* Chicago 1955, Mar., v. 11, No. 3, 208–11

...ngs in cases of
...ses of silicosis
too often seen
or less normal
...mon in over-

weight persons. Emphysema with one or more adhesions of the diaphragm due to past pleurisy may simulate an asbestosis film and the "ground-glass-appearance" is easily read into such a film. The effect of plenty of coal-dust may be hard to distinguish.

A history of exposure to asbestos dust must be found, but should not be invented merely because the patient may have done a little lagging with asbestos on a hot-water pipe. Asbestosis develops only after long periods of exposure to dust in considerable amounts. But we have no certain accepted maximum allowable concentration to guide us. Little attention should be paid to first-stage borderline cases with little or no disability. The only persons to recommend to less dusty work are persons under the age of 40 with a clear-cut diagnosis, and cases where progression is seen on serial films, regardless of age. More attention should be directed to differential diagnoses, in preference to accepting asbestosis in every case of an obscure X-ray film and an even more obscure occupational history. *E. L. Collis*

SECO, F. Asbestosis pulmonar. Contribucion al estudio de esta neumoconiosis. **[Pulmonary Asbestosis]** 94 pp., 3 pls. [Bibliography.] 1950. Madrid: Ministerio de Trabajo.

CLERENS, J. Recherches sur l'asbestose pulmonaire en Belgique. **[Research into Pulmonary Asbestosis in Belgium]** *Arch. Belges Méd. Sociale, Hyg., Méd. du Travail et Méd. Légale* 1950, Nov., v. 8, No. 9, 557–65, 13 figs. (7 on 2 pls.)

Asbestos is used in many industries, but in the present enquiry only the fibro-cement industry comes under consideration. In this work asbestos is crushed and mixed with cement. During the processes harmful dust is generated, but closed-in apparatus is used which prevents most of the dust from escaping into the air. Dust samples showed that, even in the places where there was most dust, only from 740 to 1,490 particles per cc. of air were found, of these, 50 per cent. were less than 5 microns in size. Such dustiness is not excessive. The workers exposed to the dust have been examined periodically over a period of three years. Out of 75 of these men who had been employed for varying periods (7 for over 30 years), 70 gave no signs of any dust troubles, 4 were doubtful, and only one presented ... This

as were the rest of the pulmonary tissues. No ... but through-
" which are
g in living
ous zones,
in the alveoli, and even included within giant phagocytes. This man, aged 49, had been totally incapacitated with pronounced dyspnoea on exertion and cardiac failure. Particles of asbestos were found in 10 out of 12 samples of sputum and "curious bodies" in 3 samples; such findings, however, were not associated with X-ray shadows indicative of pulmonary fibrosis. The evidence is against much danger arising from the manufacture of fibro-cement.

E. L. Collis

PNEUMOCONIOSIS DUE TO SILICATES

LUTON, P, CHAMPEIX, J & FAURE, P. Un cas d'asbestose pulmonaire. (Évolution radiologique Étude anatomo-pathologique) [**A Case of Pulmonary Asbestosis with its Development followed by X-Ray, and its Post-Mortem Study**] *Arch. Malad. Professionnelles* Paris 1951, v 12, No 6, 629–33, 8 figs

The case reported is said to have been the first one of asbestosis known to have occurred in France The man, aged 62, came under observation in 1943 after having been exposed to asbestos dust for 11 years in a factory where asbestos cloth was woven The number of particles in the working environment varied from 2,250,000 to 4,000,000 per litre of air, and the size was from 1 to 2 microns in diameter When seen he complained of dyspnoea on exertion, and showed some cyanosis of his lips From then onwards during 7 years until he died, he was watched and the progress of the X-ray shadows of the lungs was noted At first the network of both lungs, particularly in the lower two-thirds, was accentuated At the end the shadows indicated pronounced fibrosis of the ground-glass variety in the lower parts of both lungs, contrasting with clear apices No nodulation was present After death the structure of the lungs showed general thickening throughout, especially of the pleurae, but with no localized nodules Many asbestos bodies were seen, isolated and in groups, together with giant cells and mineral particles These changes are well illustrated No evidence of tuberculosis was found The dust particles could be traced not only in the vessels of the lungs, but also in the vessels of the liver, kidneys and spleen In contrast to silica dust, asbestos particles seem to exert more of a mechanical than a chemical influence upon the pulmonary tissues

E L Collis

ASTENIER, H, DENOLIN, H, DECOSTER A, CAMMAERTS, P & DENOLIN-REUBENS, R Étude clinique et physiopathologique d un cas d'asbestose pulmonaire [**A Clinical and Pathological Study of a Case of Pulmonary Asbestosis**] *Arch Belges Méd Sociale, Hyg, Méd du Travail et Méd Légale* 1952, Feb, v 10, No 2, 61–70, 2 figs [17 refs]

A diagnosis of asbestosis must depend upon a history of occupational exposure to the dust of asbestos, associated with symptoms of interference with the functioning of the respiratory organs A case is reported of a woman who came under notice in July, 1951 She had worked for 25 years in a factory weaving asbestos with great exposure to dust, and had been suffering from dyspnoea for six months which compelled her to take to her bed, there was loss of appetite, bad cough, abundant grey sputum and marked dyspnoea on effort X-ray showed a picture of generalized fine micro-nodules over both lungs, more pronounced at the bases Asbestos bodies were found in the sputum The diagnosis having been made, a close physical examination was undertaken to discover any other points. The authors compared this case with those of uncomplicated silicosis; in the latter residual air is frequently increased; expiration is prolonged; the maximal respiratory capacity is reduced, but hypernoea is less, rapid breathing is not so intense, and anoxaemia is never so important during effort. These differences are stressed as important when necessity may arise in determining the occupational origin of some case with an obscure diagnosis

E. L Collis

BEHRENS, W, Jr. Über Klinik und Pathologie der Asbestosis. [**The Clinical Picture and Pathology of Asbestosis**] *Ztschr. f Unfallmed. u. Berufskrankh* 1952, June 15, v. 45, No 2, 129–40, Sept 15, v 45, No 3, 179–89. [150 refs]

This is a general account of asbestosis introduced by mention of the uses of asbestos centuries ago for woven garments for the dead during cremation and as wicks for the lamps of the vestal virgins The chief chemical and physical characters of different kinds of asbestos belonging to the 2 main groups of this mineral—amphibolite and chrysolite asbestos —are recorded The world distribution of asbestos and its mining, treatment and use are shortly described as well as the industries in which dust inhalation hazards may be met with Reference is made to the published work of a considerable number of authors who have studied asbestosis since the first records of the disease in about 1906, and give their observations on the effect of length of exposure to asbestos dust in different concentrations.

The symptomatology and diagnosis, and the X-ray findings in the different stages of the disease are given

Special mention is made of the association of asbestosis with carcinoma, which is contrary to experience in cases of silicosis Post-mortem reports from the literature indicate that in 309 cases of asbestosis there were 44 lung carcinomas (14 2 per cent) whereas in 2,204 cases of silicosis only 32 carcinomas were found (1 4 per cent)

The experience of the association of tuberculosis and asbestosis varies greatly in different countries English workers have recorded a high rate of tuberculous infection in workers in asbestos, and the Home Office reports for 1933 to 1939 include 90 deaths from asbestosis, among which there was tuberculosis in 32 This is, however, to be compared with the silicosis deaths (1932 to 1939)—there were 797 tuberculous infections in a total of 1,397 fatal cases of silicosis In America, tuberculosis is a rare complication of asbestosis Some figures from the German experience record that among 500 definite and 200 doubtful cases of asbestosis there were found only 11 instances of active and 51 of inactive tuberculosis, whereas among cases of silicosis the incidence of tuberculosis was 35 per cent in the slight and 63 per cent in the severe degrees of silicosis

The rest of the paper consists of a description of the

macroscopic and microscopic appearances of the lungs in asbestosis as well as a discussion, with an excellent reference list, of the nature and significance of the "asbestosis bodies" about which there have been so many differences of opinion.

M. E. Delafield

CARTIER, P. **Some Clinical Observations of Asbestosis in Mine and Mill Workers.** *Arch. Indust. Health* Chicago 1955, Mar., v. 11, No. 3, 204–7.

The author writes after 9 years of medical supervision of some 4,000 asbestos mining workers. Annual medical and X-ray examinations are brought under review; 58 cases came to autopsy; 128 cases of asbestosis were detected, and 88 of the patients are still alive. Consideration of the age distribution of the cases of asbestosis and of the causes of death of those

noma are of special interest and may suggest a possible relationship between asbestosis and pulmonary carcinoma though this remains questionable To summarize the evidence asbestosis is considered a serious disease in some instances, but more frequently it remains a disease which can be tolerated quite well for many years, even without appreciable symptoms, so long as some other serious disease does not complicate the position. Its presence, however, must always introduce medico-legal questions difficult to solve Compensation boards may tend to give undue weight to the presence of any degree of asbestosis.

E L Collis

STOJADINOVIĆ, M Prve azbestoze i proste pneumokonioze od uglja u našoj zemlji [**First Cases of Asbestosis and Simple Pneumoconiosis caused by Coal Dust in Yugoslavia**] *Arhiv Hig Rada* Zagreb 1954, v 5, No 1, 57–76, 3 figs on 3 pls [38 refs]

The English summary appended to the paper is as follows —

"The author's task was to find out whether in the asbestos mines and factory (the latter working only since 1947) at Korlače in the Ibar basin there were cases of pneumoconiosis so that the necessary technical protection could be introduced. Geomorphological, mineralogical, petrographical and chemical data pointed to the likelihood of that group of workers suffering from anthraco-silicosis in addition to asbestosis

"The author describes the production process and the method of work, he also discusses information on ecological and other factors on the various categories of workers However, the bulk of the workers are either peasant-miners or professional miners A socio-economic enquiry organized among the workers brought forward the following problems awaiting solution hygiene of housing, healthy vacations, food and clothing, organization of hygiene in the factory The enquiry touched also on the problem of the fluctuation of workers in the various mines That fluctuation may account for the large number of mixed pneumoconioses in that region

"Only 80 workers (22·2%) were examined out of the total of 360. Radiographies on normal film were made of 76 workers (21·1%)

"The clinical and radiological part contains data obtained from examinations, radiographs and laboratory work The objective findings include a high incidence of conjunctivitis (71·2%), goitre (31 7%), bronchitis (50%), diminishing of vital capacity (in 84 9% of cases), diminishing of the respiratory stretching of the thorax (in 84 9 per cent of cases) and changes in the orthodiagram of the heart

"The author describes the radiographs, the classification of pneumoconiosis in the workers as well as its diagnosis. He discusses difficulties and errors relating to the interpretation of radiographs as well as the differences of opinions referring thereto

"Out of the total of 76 radiographs 6 (7 8%)

5 cases"

FARRIS, G. Verruche da amianto ed altre manifestazioni cutanee nei lavoratori dei "coibenti" [**Asbestos Warts and other Dermatoses in Workers with Lagging Materials**] *Rass Med. Indust* Turin 1953, Jan–Feb, v 22, No 1, 1–17, 12 figs [17 refs]

The author has followed up 29 such workers and found from 1 to 4 warts in every case, mostly on the palms, 3 showed warts on the dorsal aspect of the hands The range of lagging materials in use includes asbestos cord, which is wound round pipes, *etc*, various asbestos-containing slabs, which are incorporated in or otherwise applied to partitions or other flat surfaces, and mixtures of asbestos and cement which are in the form of paste to be moulded to the shape of the tank or other object which is to be insulated

The warts are due to asbestos fibres which penetrate into the epidermis or get lodged, deeper still, in the corium or true skin and produce reactions in these tissues respectively The epidermis shows acanthosis [thickening of the prickle-cell layer] and hyperkeratosis [increased horny tissue] and the corium shows

discussed

Stoll, R, Bass, R & Angrist, A A **Asbestosis associated with Bronchogenic Carcinoma.** *Arch. Intern. Med.* 1951, Dec, v 88, No 6, 831–4 [14 refs]

All previous references to any association of asbestosis with pulmonary carcinoma are brought together While they are in the bulk suggestive, data upon which statistical proof can be based are hard to collect But in one enquiry out of 235 cases of asbestosis there were 31 instances of pulmonary carcinoma, or 13 2 per cent to compare with 1 0 per cent of pulmonary carcinoma in the general population Another worker found 7 5 per cent among 40 cases of asbestosis, and yet a third found 14 8 per cent in 115 cases of asbestosis A new case is now reported of a man who had worked for 6 years covering pipes with asbestos, refusing to wear any respirator. He came under notice with weakness and persistent cough Nothing definite was found until the bone marrow was examined, when clumps of malignant cells were seen X-ray showed generalized large discrete oval shadows, indicative of pulmonary

areas of necrosis existed throughout the lung Typical club-shaped brown asbestos bodies were seen in and outside the tumour areas The examination established the existence of anaplastic carcinoma of the lung with possibility of multicentric origin and numerous metastases, associated with pulmonary asbestosis. The opinion is suggested that the silicate in asbestos must itself be directly carcinogenic It establishes an additional reason for preventive measures, with careful dust control, in the use of asbestos *E L Collis*

Werber, M Lungen-Asbestose und Karzinom **[Asbestosis and Carcinoma of the Lung]** *Zent f Arbeitsmed u Arbeitsschutz* 1952, Nov, v 2, No 6, 179–80, 3 figs

Report of a case

Bonser, Georgiana M, Faulds, J S & Stewart, M J **Occupational Cancer of the Urinary Bladder in Dyestuffs Operatives and of the Lung in Asbestos Textile Workers and Iron-Ore Miners.** *Amer J Clin Path* 1955, Feb, v 25, No 2, 126–34 [22 refs]

After a short discussion of occupational cancer in general, the authors give a table classifying industrial cancers by their causes, indicating in which cases experimental proof has been obtained, and then proceed to discuss recent work on the groups in which they are specially interested

* * *

Occupational Cancer of the Lung

In Asbestos Textile Workers. In 1925 one of the authors (M J. S) in a series of 72 (40 male and 25 female) autopsies on workers in two asbestos fac-

of cancer of the lung, in contrast to the dyestuffs industry, in which death was accelerated by the supervention of cancer of the bladder. The degree of fibrosis was less in the lungs with cancer than in

pleural; there was one rhabdomyosarcoma, the rest were adenocarcinoma or oat-cell carcinoma. There were also 4 peritoneal anaplastic carcinomas, the primaries of which were not found.

Regulations for the control of asbestos dust were introduced in 1931 and will doubtless lead to the disappearance of severe degrees of pulmonary fibrosis

less in the lungs with cancer

The common factor in these two types of occupational lung cancer is silica and it is suggested that

DOLL, R **Mortality from Lung Cancer in Asbestos Workers.** *Brit J. Indust Med* 1955, Apr., v. 12, No 2, 81–6 [14 refs.]

Sixty-one cases of lung cancer have been recorded in persons with asbestosis since the first case was reported by LYNCH and SMITH (*Amer. J. Cancer*, 1935, v. 24, 56) In the Annual Report of the Chief Inspector of Factories for 1947 [this *Bulletin*, 1949, v. 24, 586]* MEREWETHER reported that cancer of the lung was found at autopsy in 13 2 per cent. of cases of asbestosis [see also BONSER *et al*, *ibid.*, 1955, v 30, 613]† Animal experiments are inconclusive. Since 1935 records have been collected of all the coroners' necropsies on persons known to have been employed at a large asbestos works, 105 in all are summarized, there were 18 cases of *cancer of the* lung, 17 in males and one in a female, 15 persons with asbestosis present and 3 in persons without asbestosis. All the subjects in whom the two diseases were found together had been employed for at least 9 years before the national regulations for the control of asbestos dust were introduced in 1931 The mortality among a section of the male employees of the works referred to, who had worked for at least 20 years in "scheduled (*i e.*, dusty) areas" was compared with the mortality recorded for all males in England and Wales; the incidence of cancer of the lung among men employed for different periods under the pre-1933 conditions were compared. The numbers of men alive in each 5-year age-group were counted separately for each of the years from 1922 to 1953; the causes of death as given on the death certificate or as finally determined by necropsy were classified as lung cancer, with or without mention of asbestosis, other respiratory and cardiovascular diseases, with or without mention of asbestosis, neoplasms other than lung cancer, and all other diseases. The numbers in each category were then compared with those which might have been expected to occur, by multiplying the number of men alive in each 5-year age-group by the corresponding mortality rates for men in England and Wales over the same period. Because of the small numbers in each year the populations were added together to form groups—1922–33, 1934–38 and so on—the mortality rates used were those for the middle year.

The number of men studied was 113, and 11 deaths from lung cancer, all with mention of asbestosis, occurred against 0 8 expected, from other respiratory diseases, with mention of asbestosis, 14 against 0 expected; without mention of asbestosis, 6 against 7 6, neoplasm other than lung cancer, 4 against 2 3 expected; all other diseases 4 against 4 7. In all there were 39 deaths against 15 4 expected, the excess was therefore entirely due to excess deaths from lung cancer and from other respiratory and cardiovascular diseases All the cases of lung cancer were confirmed by necropsy and histological examination and all were associated with the presence of asbestosis The risk for men employed for under 10 years, 10 to 14 years, and for 15 years and over were compared and it was concluded that the risk of lung cancer over the whole period among asbestos workers was of the order of 10 times that experienced by other men, but the risk was probably greater before 1933 and has become progressively less during recent years, as the duration of employment under the old dusty conditions has decreased *W. L. Harnett*

ROMBOLÀ, G Asbestosi e carcinoma polmonare in una filatrice di amianto (Spunti sul problema oncogeno dell'asbesto) **[Asbestosis and Pulmonary Carcinoma in an Asbestos Spinner. (Notes on the Induction of Lung Cancer by Asbestos Fibres)]** *Med d. Lavoro* 1955, Apr, v. 46, No 4, 242–50, 1 fig [40 refs]

The English summary appended to the paper is as follows —

"The first case of pulmonary carcinoma occurring in Italy in a subject affected by slight asbestosis is described The malignant neoplasia was observed in a woman 49 years of age who for 29 years had worked as a spinner in an asbestos factory The diagnosis formulated in life was confirmed by postmortem, the gross and microscopic findings of which are briefly reported The present clinical, pathological and *statistical* knowledge on *the capacity of asbestos to* cause tumors are summarized A tumor should be taken as occupational in nature only when the statistical data are correspondent to the experimental researches Whilst there are many statistical data (though not concordant for all countries) experimental researches are few and not concordant According to the author a hypothesis should be made whereby the capacity of the different types of asbestos to cause tumors differs according to their chemical composition"

LYNCH, K H & PRATT-THOMAS, H R **Carcinoma of the Lung in Asbestosis: Report of Two Additional Cases.** *Southern Med J.* 1955, June, v 48, No 6, 565–8, 7 figs

The evidence that there exists a correlation between the occurrence of asbestosis and carcinoma of the lung is collected No such correlation has been found with other forms of pneumoconiosis like silicosis and anthracosis, or pulmonary tuberculosis The pathology of asbestosis is unusual, silicosis and other pneumoconioses present reactions, usually chemical, between minute dust particles and the living tissues, but asbestosis seems to be due to traumatism between quite large particles of asbestos, too large to penetrate into the alveoli, and the pulmonary tissues Further, no efforts to induce lung cancers in animals exposed to asbestos dust have been successful Nevertheless, the statistical evidence is strong Now two more cases of lung cancer occurring in association with asbestosis are reported One man had worked in an asbestos factory for 25 years and the other for 36 years In both cases X-ray showed the diffuse granular infiltration over both lungs characteristic of

* v II, 426 † p 213

asbestosis and the lungs after death exhibited the fibrosis distinctive of asbestosis, but both patients succumbed to bronchogenic carcinoma The appearances of the lesions are illustrated The authors have seen 4 cancer cases in 49 autopsies of asbestosis, 8 2 per cent, compared with 0 7 to 2 4 per cent in autopsies taken at random *E L Collis*

JACOB, G & BOHLIG, H Über Häufigkeit und

[Numerous refs]

This is a study of the incidence of lung cancer among asbestos workers in Dresden, with numerous references to and analyses of the literature Cancer of the lung developing in asbestos workers is not recognized as an occupational disease in West or East Germany The international literature is based exclusively on the results of autopsies, the incidence among asbestos workers appears to vary between 12 and 17 per cent In Dresden, however, from research into cases at the clinic and among the asbestos workers, it appears to be a rare occurrence It is estimated that only about ¼ of these workers have an effective exposure to the dust

In co-operation with the radiological and radium institutes the authors reviewed the cases of asbestosis reported since the middle 1930s, they numbered 339 in all stages, in the first stage, O–I, there were 42 females and 61 males, stage I, 43 f and 74 m, stage II, 32 f and 61 m, stage III, 13 f and 17 m Silicosis was found in 8 males In 5 females and 10 males active, open tuberculosis was found, in this series the incidence of active tuberculosis was 4 4 per cent Four fatal cases of lung cancer in asbestos workers, which occurred in Dresden up to 1954, are described The first patient was a woman of 46 who had been employed for 3 years, when young, as an asbestos weaver, autopsy showed typical asbestosis, with asbestos bodies, and with squamous-cell epithelioma of the right middle-lobe bronchus, no metastases were found, the asbestosis was not diagnosed during life, the radiographic changes in the lungs having

lobe, with metastases, and a caseating tuberculous lesion in the left lower lobe The third was a woman of 57 who had worked in asbestos, between 1922 and 1930, for 3 years as a moulder and 5 years as a weaver; she died in 1954, there was definite asbestosis and a solid, spreading carcinoma of the right upper-lobe bronchus, with infiltration of the lung parenchyma and widespread metastases The fourth was a man of 66 who was known at the clinic as an asbestosis patient, diagnosed radiographically 5 years before, he had been employed in asbestos as an opener from 1927 to 1930 and as a spinner from 1931 to 1948, autopsy, in 1955, showed a right-side bronchial carcinoma with widespread metastases in the lymph glands, liver and skeleton

A long discussion of the literature on cancer among asbestos workers includes an examination of the characteristics of the disease the duration of expo-

incidence of cancer in asbestosis In future, cases of cancer of the lung in asbestosis should not be published individually but should always be considered in the framework of the whole asbestos industry in the region *E L Middleton*

LEICHER, F Primärer Deckzellentumor des Bauchfells bei Asbestose **[Primary Cortical-Cell Tumour of the Peritoneum in a Case of Asbestosis]** *Arch f Gewerbepath u. Gewerbehyg.* 1954, v 13, *No* 4, 382–92, 10 figs [Numerous refs]

The case reported here was that of a man aged 53 who had been employed for 26 years, in the period 1919–51, spinning coarse yarn and asbestos; during 16 years of that time he had been exposed to high concentrations of asbestos dust In 1937 slight asbestosis was diagnosed, in 1947 he had pleurisy with effusion, and in 1950, in a routine examination, calcified tuberculous foci were found scattered over both lungs, without active disease. In 1951 asbestos bodies were found in the sputum and severe symptoms

Autopsy showed tuberculous disease of the lumbar spine with bilateral psoas abscess and mixed infection in both lungs Asbestosis, stage II, was found in the lungs with diffuse fibrosis, there was slight asbestosis in lymphatic glands and asbestos bodies were found in the spleen On the peritoneum of the mesentery and over the peritoneal cavity there were thickened patches and many small nodules from a pin head to a millet seed in size, a flat tumour, half the size of a hand and 1 cm in thickness, was attached to the peritoneum on the under surface of the diaphragm The results of the histological examination of the tumour are fully described, illustrated and discussed; no typical asbestos fibres or asbestos bodies were found after careful search, but asbestos was found in the tissues of the tumour by X-ray diffraction examination It is uncertain how the asbestos reached the peritoneal cavity, the most probable route was thought to be by direct penetration by the asbestos fibres from the lung through the pleura and thence through the diaphragm. *E L. Middleton*

EVEN, R., SORS, C. & COLBERT, J. Silicatoses. [**The Silicatoses**] *Semaine des Hôpit. de Paris*. 1952, Oct. 2, v. 28, No. 73, 2936–40, 5 figs.

The term "silicatoses" is applied to pneumoconioses ca[illegible] containing silicates, but no free silica, [illegible] (magnesium silicate), ta[illegible] Observations are quote[illegible] men exposed industrially to dust of talc [illegible] 28 years respectively, and upon 3 men exposed to dust of kaolin for 20, 16 and 15 years respectively The X-ray appearances of the lungs of each of these 5 men are illustrated. Fibrotic changes are present showing more in the central and hilar areas than in the apices and bases; they are symmetrical, and nodular, rather than reticular In 2 instances there was superimposed tuberculous infection; one with talc and one with kaolin exposure The first clinical sign was bronchitis with expectoration without any complaint, then dyspnoea developed, and finally cardiac insufficiency ushered in a fatal issue, sometimes preceded by spontaneous pneumothorax. Far more observations are needed before any definite conclusions can be drawn But three hypotheses are advanced, first that silicatoses really exist, and here asbestosis may be instanced. second that silicatoses only exist as endogenous silicosis due to disintegration of silicates in the tissues with the freeing of silica, which then induces its recognized reaction, and third that silicatoses do not exist and that the manifestations seen are those of silicosis of exogenous origin, due to the presence, in the dusts of the silicates, of more or less free silica. Whatever hypothesis be selected to interpret the findings there is no doubt about these findings themselves, which medico-legally establish a claim to compensation.

E. L Collis

LYNCH, K M & MCIVER, F A **Pneumoconiosis from Exposure to Kaolin Dust: Kaolinosis.** *Amer J Path* 1954, Nov-Dec, v 30, No 6, 1117–27, 7 figs on 5 pls

The post-mortem findings are described of two men who had been exposed to considerable amounts of fine dust from kaolin, got from open workings, while it was being processed for various industries Kaolin, or china-clay, is hydrated aluminium silicate in which particles less than 2 microns predominate. No special examination of the kaolin was made Nearly all kaolins contain varying amounts of free silica, but silicates form the greater part. The men had been employed for 17 and 22 years respectively. X-rays before death gave diagnoses of (a) advanced pneumoconiosis with infection; extensive confluent consolidation and nodular infiltration, and (b) advanced pneumoconiosis with infection, confluent consolidation, nodular infiltration, cavitation and emphysema Excellent illustrations show the microscopic appearances of dense hyalinizing fibrosis with alveolar obliteration. The massiveness of the involvement of the upper parts of the lungs is remarkable.

The bluish colour created by the dust deposits in the lungs was a distinctive feature *Nodular* fibrosis with massive whorled collagenous deposits formed the more bulky changes. During life respiratory difficulties were experienced by at least one of the men.

[Having regard to the pronounced pneumoconiosis described, exact findings of the kaolin dust are badly needed Kaolin is an insoluble dust containing aluminium silicate which, as KING [above, p. 52] has pointed out, depresses the solubility of any free silica present, so that such dusts do not set up any marked fibrosis as here described. The exact infection mentioned is not stated, though the cavitation in one case suggests tuberculosis. Respiratory difficulties were experienced during life, but, although massive whorled collagenous deposits composed the bulky changes, these two cases do not establish the existence of 'kaolinosis'.]

E. L. Collis

MCLAUGHLIN, A. I G. **Talc Pneumoconiosis.** *Arch. Belges Méd. Sociale, Hyg., Méd. du Travail et Méd. Légale* 1950, July, v. 8, No 7, 451–60, 12 figs. (2 on pl)

Talc is a hydrated magnesium silicate, similar in chemical composition to asbestos, it is a flaky mineral, but also occurs as fibres When crushed it forms a smooth bland powder used for a wide variety of purposes, from toilet powders to a powder for "tacky" rubber tyres In the production of tyres there is a regular exposure to plenty of dust Doubt has been expressed whether talc dust can originate pneumoconiosis Abnormal X-ray appearances have been reported with little or no fibrosis or respiratory incapacity Two cases are now recorded. One patient still alive, has dyspnoea, clubbing of the fingers, and an X-ray picture like that of early asbestosis The second worked for 30 years powdering rubber tyres When first seen he had aortic regurgitation (from childhood chorea) and signs of pulmonary fibrosis *He* went steadily downhill and died 2 years later, death being ascribed to aortic regurgitation and pneumoconiosis Throughout both lungs were small grey nodules, under the microscope diffuse fibrosis was seen and numerous "curious bodies" were found, similar to those found in asbestosis These bodies may be formed from a fibre on which iron from the blood is deposited. The factory dust was composed mostly of flakes of talc with only a few fibres, but the particles in the lungs were in the form of straight fibres of talc, all being under 10 microns in length with an average of 5 microns Without doubt the fibrosis in the lungs was definitely associated with the presence of the particles of talc dust

Talc granulomata are said to have occurred in the abdomen as a result of contamination with talc glove-powder introduced at operation. [No evidence is adduced that pneumoconiosis due to talc predisposes to tuberculosis or that it incapacitates its possessor.]

E. L. Collis

BAADER, E. W. Neues über Talklunge und Talkgranulom. **[Talc Lung and Talc Granuloma]** *Deut med Woch* 1950, Jan 6, v. 75, No 1, 50-51 [12 refs]

This is a study of the recent literature on pneumo-

raw material and in its use in industry, and to the

panied by tuberculosis, and asbestosis, alone or associated with cancer of the lung Talcosis would be

progressive tuberculosis

E L Middleton

BUUS-HANSEN, A, FROST, J & GEORG, J **Talcosis pulmonum.** *Ugeskr f Laeger* 1950, Dec 7, v 112, No 49, 1691-7, 2 skiagrams [26 refs] English summary

In 1940, the Danish public health authorities investigated the possibility of talc poisoning in two rubber factories, and in one of them ten workers who had been employed in it from 15 to 30 years were examined with special reference to deposits in the lungs All the skiagrams were normal, and there were no complaints of symptoms In 1949, one of these factories was again studied with reference to talc poisoning, and five workers with the longest time of employment (from 19 to 29 years) were examined A worker who had been employed for 29 years showed diffuse radiographic changes in the lungs The present publication gives a detailed account of five cases in which there were radiographic

years of exposure to the dust But after a further period of 10 years there were marked radiographic changes None of the five workers presented any symptoms of talc poisoning, but three of them showed a slight reduction of pulmonary function The authors recommend measures for the reduction of talc dust in the industries concerned, and they suggest that when such pulmonary changes as they found are demonstrable, it is advisable to move the worker to a less dusty employment

Claude Lillingston

KÖHLER, G., LEOPOLD, G & STEYER, W. Zur Frage der Talkumpneumokoniose. **[On Pneumoconiosis due to Talcum]** *Ztschr. f ärztl Fortbildung* 1951, July 15, v. 45, Nos. 13/14, 375-82, 7 figs.

The existence of pneumoconiosis due to inhalation of talcum dust is taken as established A survey was made in a factory in Leipzig making powder for cosmetic and medical purposes, where until 1944 talcum was the only mineral base used, although during the last few years minor amounts of colloidal silica and kaolin were used for a time. Among 28

capacity and a shortened apnoeic pause for stage II. The radiological findings are described and discussed in detail and they are illustrated by rather poor

materials and of dusts collected on test plates are

height of 6 feet contained only 0 6 per cent by

can be demonstrated Both are women of ages 43 and 46 years and their removal from further dust exposure is recommended.

G Nagelschmidt

HULTGREN, G V Undersokning rörande hälsorisk vid hantering av talk **[Investigations of the Risk to Health on Handling Talc]** *Svenska Läkartidningen.* 1951, Mar. 2, v. 48, No 9, 540-42

Before giving an account of investigations in Sweden, Hultgren draws attention to recent changes abroad in the attitude taken to talc as a possible cause of industrial diseases. Thus in his work on occupational diseases published in 1942, the American

JOHNSTONE stated that no evidence had been found indicative of changes in the lungs due to talc. But in his work "*Occupational Medicine and Industrial Hygiene*" published in 1948, he referred to several cases of pneumoconiosis shown on post-mortem examination to be due to talc. Speaking in Stockholm in 1949, the German expert in industrial hygiene Dr. E. W. BAADER admitted that talc may provoke changes in the lungs, but that to be severe there must be an exposure to talc for a score of years. A year earlier REDELL discussed the risks of talc poisoning in the organ of the Swedish Medical Association, *Svenska Läkartidningen.* In his opinion talc granuloma and other lesions would be found to complicate operation wounds comparatively often once attention was drawn to this possibility. He

rubber material for more than 25 years. Among 57 workers who had been in contact with talc there were ten who had been so for more than 15 years—two of them for 25 years. Some of them had complained of discomfort from talc dust. The radiological examination of the lungs in these ten cases showed a certain number of old tuberculous foci and

that the talc risk is now kept in mind in the planning of factories in which talc is used.

Claude Lillingston

FRIEDMAN, P. S., BELL, M. A & SOLIS-COHEN, L **Talc Pneumoconiosis.** *J. Amer. Med. Ass.* 1952, Apr. 19, v 148, No. 16, 1418–19, 2 figs.

Talc is a hydrous magnesium silicate, it is used freely as a smooth powder, especially for rubber articles. The claim has been made that its inhalation will originate pneumoconiosis In support of this claim a case is reported of a man who for some 24 years had worked manipulating rubber ribbons heavily coated with talc powder in an atmosphere cloudy with talc dust. At age 65 he came under observation with a chronic cough of long standing He had a thoracotomy scar over the lower posterior hemithorax. X-ray disclosed diffuse pulmonary fibrosis, pulmonary emphysema, pleural thickening, and a talc plaque in the right hemithorax. There were also foci of pulmonary calcification. The sputum was negative for tubercle bacilli Other

due to

itment.

Attention is drawn to linear areas of pleural density due to talc plaques which are said to be present in over 6 per cent. of talc miners The symptoms seen which are distinctive of talc fibrosis are dyspnoea, chronic cough, chest pain and fatigue Limited chest expansion is invariable Some emphysema is usual with fibrosis of a fine linear and granular character. The plaques are ascribed to accumulations of talc in peripheral lymphatics with lymphatic dilatation and stasis, associated with calcium localization Steps should clearly be taken in industry to minimize exposure to talc dust. *E. L. Collis*

JAQUES, W. E. & BENIRSCHKE, K. **Pulmonary Talcosis with Involvement of the Stomach and the Heart. Report of a Case.** *Arch Indust Hyg. & Occupational Med* Chicago 1952, May, v. 5, No 5, 451–63, 5 figs [Refs. in footnotes]

The case here reported as one of talcosis was in a man aged 42 who prior to 1942 had worked for 16 years in a shoe factory with much exposure during the last 6 years to powdered talc, used to prevent layers of leather from adhering From 1942 onwards he worked as a carpenter with no further exposure to dusts. He first came under observation in 1943 with cough and dyspnoea on exertion Silicosis was suspected, but not confirmed. The chest condition got steadily worse, until he was admitted to hospital for the fifth time in 1950, when he died 8 hours after admission. At no time had it been possible to make a certain diagnosis. The heart had shown "cor pulmonale" distinctive of progressive pulmonary fibrosis,

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differs tremendously, it may be pure calcium carbonate, or mixtures of talc, tremolite, carbonates and serpentine, it may contain some quartz. Seven commercial talcs contained crystals below 10 microns in length.

The predominating pathological features found in this case were extensive pulmonary fibrosis and

ascribed to talc dust Certain talc crystals were definitely identified in the tissues; but the length of time between exposure and death, 7 years, must render such findings of doubtful significance The cardiac and gastric lesions are looked upon as a direct reaction to the talc. Reasons are given for discarding fungus disease and sarcoidosis as possible diagnoses.

E. L. Collis

SMITH, Adelaide R. **Pleural Calcification resulting from Exposure to certain Dusts.** *Amer. J. Roentgenol.* 1952, Mar, v. 67, No. 3, 375–82, 12 figs. [11 refs.]

"An increased incidence of pleural calcification is

found in workers exposed to the dust of tremolite talc and muscovite mica. It is suggested that this may be due to pleural irritation produced by these dusts plus the presence in them of calcium and magnesium which act to stimulate calcium deposition "

MANN, B & DEASY, J B **Talc Pneumoconiosis in the Textile Industry.** *Brit Med J* 1954, Dec 18, 1460–61, 1 fig [16 refs]

The case is reported of a man who for 39 years had been employed as a picker maker He had to make leather thongs, or pickers, used for driving shuttles which carry the weft threads from side to side through the warp threads on the weaving loom The hide from which the thong or picker is made, after being thoroughly damped, has to be dusted liberally on both sides with French chalk which is hydrated magnesium silicate or talc. During the operation of dusting the air is cloudy with fine talc dust Talc consists of fibres from 4 to 10 microns in size, and if it is inhaled, talc plaques may be detected in the lungs radiologically In the present case X-ray showed a lattice or matrix-work background on which nodular deposits were superimposed Probably the case was complicated by apical pulmonary tuberculosis. Talc pneumoconiosis is considered to be a rather slowly developing fibrogenic disorder, somewhat similar to asbestosis The man had begun to experience dyspnoea and a mild productive cough Others have reported talc granuloma as occurring in abdominal surgery following the use of surgical gloves powdered with talc *E L Collis*

ALIVISATOS, G P, PONTIKAKIS, A E & TERZIS, B **Talcosis of Unusually Rapid Development.** *Brit J Indust Med* 1955, Jan , v 12, No 1, 43–9, 6 figs [36 refs]

The cases of 8 men are reported who worked in a talc factory pulverizing pieces of soapstone and

periods of exposure. The exposures in cases 1, 2, 4, 5, 6 and 8 varied between 16 and 24 months , it reached 40 to 60 months only for cases 3 and 7 The X-ray shadows showed scattered mottling of the lungs, becoming confluent and soon progressing to tumour-like appearances Six X-rays are illustrated , the shadows are unusual, more like those seen in cases of asbestosis than in silicosis In no case could superimposed tuberculosis be detected The dust particles in the air were frequently too numerous to count , but in 12 samples counts per litre of air varied between 730,000 and 1,925,000 particles Chemical analysis did not disclose the presence of any free silicic acid in the talc, but only of silicate salts

Dust control in the factories concerned is urgently needed *E L Collis*

HEIMANN, H., MOSKOWITZ, S , IYER, C R H , GUPTA, M N. & MANKIKER, N. S **Note on Mica Dust Inhalation.** *Arch Indust. Hyg. & Occupational Med* Chicago 1953, Dec , v. 8, No 6, 531–2

The authors, in India, examined 61 workers in factories, to which crude mica is brought for processing The dust concentrations ranged from 2,000,000 to 3,000,000,000 particles per cubic foot, and only a few workers had been exposed for more than 5 years The examination included X-ray, which showed "ground-glass 2 reading" in 27, and "ground-glass 1 reading" in 14, of the workers (together 67 per cent) There was no dust effect beyond this

The results indicate that the generally accepted maximum allowable atmospheric concentration (20,000,000 particles per cubic foot) is probably correct *Charles Wilcocks*

GATTNER, H Die Bleicherde-Lunge **[Fullers'-Earth Lung]** *Arch f Gewerbepath. u Gewerbehyg* 1955, v 13, No 5, 508–16, 2 figs

The *bleicherde* referred to here comprised a number of natural clays composed chiefly of aluminium hydro-silicates, and including varying amounts of Mg, Ca and Fe as well as other bases, combined silica amounted to 50–60 per cent The chief mineral was montmorillonite which has a lattice structure similar to that of the mica group The clays are obtained from sedimentary deposits in various parts of Germany In the factory where this study was made the material used at first was clay from Bavaria, later bentonite from Hungary and Rieder clay from Saxony were used The amount of quartz in the clays varies widely and it may reach 20 per cent , or, as shown by examination of some consignments, it may be absent altogether In this factory enquiry showed that up to 1940 quartzose sand had been added to the clay in various proportions up to 20 per cent The manufacturing process consists in mixing the clay with water and hydrochloric acid, heating, pressing to remove liquid and drying in ovens , the material is then ground in a ball-mill and filled into containers

Nine men employed in the factory were examined ; the history and clinical and radiological findings of 2 of these men are [illegible] first was [illegible] us pro- [illegible] ural, to [illegible] 1 years [illegible] for 10

years grinding the dried material in the ball-mill and was there exposed to the dust from the filling process When he left that work he was 44 years of age When he was 58 a chest radiograph showed pneumoconiosis, grade II–III, with diffuse, finely granular shadows over both lung fields, more dense in the upper zones, and with uniform, cloudy opacity at both apices There were no symptoms of ill-health, no tubercle bacilli were found in the sputum after concentration The second man was aged 47; he was employed for 14 years milling the clay in the same factory T
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changes appeared to be more marked The diagnosis in this case was pneumoconiosis, grade I–II There were no symptoms Of 7 more men employed at the factory radiographs showed one with doubtful early signs, one with uncertain result, and the remaining 5 negative, in the author's opinion, diagnoses given at a radiological institute placed the first 2 of these and one of the negatives as grade I, and one as having commencing signs. In this series of radiological examinations the man with the longest period of employment, 15 years, had a negative radiograph. The periods of employment of the others were comparatively short

The conclusion reached is that the dust of this material is injurious, although not capable of causing silicosis This possibility has apparently not been recognized generally, and preventive measures have been neglected

[Fullers'-earth, composed chiefly of montmorillonite, was known as a cause of pneumoconiosis See MIDDLETON (1940), *Proc Internat Conf Silicosis*, I L O Geneva Studies and Reports, ser. F (Industrial Hygiene) No 17, p 134. A fatal case, with autopsy, was described by CAMPBELL and GLOYNE (this *Bulletin*, 1942, v 17, 381 See also TONNING, *ibid*, 1950, v 25, 1259)] *E L. Middleton*

ROTTER, W. & GARTNER, H Über eine Pneumokoniose bei einem Feldspatarbeiter **[Pneumoconiosis in a Feldspar Worker]** *Zent f Arbeitsmed u Arbeitsschutz* 1954, Mar, v 4, No 2, 35–40, 8 figs

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The feldspar dust contained 27 1 per cent of potassium feldspar (K Al Si_3O_8), 14 7 per cent of sodium feldspar (Na Al Si_3O_8); 12 8 per cent of kaolin and other minerals, and 45 4 per cent of quartz

Post-mortem examination showed, in addition to extensive chronic tuberculosis of both lungs, with caseation and cavitation, diffuse dissemination of large-cell dust granulomata in both lungs

These nodules, which surrounded the small arteries and extended into the alveolar walls, consisted of *macrophages*, 1–2 μ in size, containing brown or black *amorphous* dust. Confluent granulomata resembled silicotic nodules, but there was very little increase of *reticular* fibres, no hyaline formation and very little *increase* of collagenous tissue The lymph nodes contained similar dust granulomata

Microscopic and polarimetric examination of the *dust particles* obtained from the lung tissues by ashing and defatting showed that many were doubly *refractive*.

In discussing the reason why the lesions were not typical of silicosis in view of the quartz content of *the feldspar*, the authors suggest that the aluminium *potassium*, sodium and calcium ions or oxides in the feldspar tend to inhibit or neutralize the silicotic effect of the crystalline quartz particles

Ethel Browning

POLICARD, A. & COLLET, A. Recherches expérimentales sur la nocivité des poussières de feldspath. **[Experimental Research into the Harmful Nature of Feldspar Dusts]** *Arch Malad. Professionnelles* Paris 1954, v. 15, No. 5, 343–50, 4 figs.

Feldspars occur in most igneous rocks and exposure to their dusts is frequent There are 3 feldspars; the commonest is orthose, a silicate of aluminium and potassium; then comes pericline, a sodium aluminium silicate, and labrador, a combination of calcium aluminium silicate and sodium aluminium silicate In order to investigate their possibly harmful properties 100 mgm. of each in fine particles less than 5μ in size were injected intraperitoneally into rats. After one month, and up to 4½ months, the consequent reactions were observed. They are shown in microscopic illustrations A certain amount of fibrosis was found, increasing with time after the injections, it was most marked for labrador, and least for orthose

With pericline the lesions were quicker to form and richer in collagen Compared with that produced by feldspars, the fibrosis caused by silica is always more intense and the formation of collagen more abundant

The feldspars are more harmful than kaolin and the micas, but less so than fluorspar or silica

E. L. Collis

PARADA, A. Silicatosis por sepiolita (silicato de magnesio hidratado) **[Silicatosis caused by Sepiolite]** *Med y Seguridad del Trabajo* Madrid. 1954, Jan–Mar., v. 2, No 6, 11–14, 2 figs on 2 pls. English summary (7 lines)

A case is described of silicatosis probably due to sepiolite (hydrated magnesium silicate, meerschaum), which has not hitherto been reported. Diagnosis was

* v II, 275. † Ibid

established by radiography, and after considering the possibility that other fibrogenic dusts might be incorporated, the author concludes that the initial fibrosis was due to sepiolite

TROISI, F. M **Silicatosis of a Micronodular Type among Women employed in Glaze Spraying on Metal Objects.** *Indust Med & Surgery* Chicago 1952, Feb, v 21, No 2, 47–9, 3 figs

Cases are here reported of lung fibrosis, diagnosed by X-ray, among women employed for many years in the glazing of iron sheets The process consists in spraying enamel on to iron sheets which are then dried, scraped and brushed, and thrust into electric ovens to melt the glaze There is exposure to the dust of the enamel powder, but the maximum percentage of free silica in the powder is 1–2 The enamel is made by mixing and roasting at 1,100° to 1,200°C quartz 25 per cent, potassium felspar 30 per cent, natural cryolite 15 per cent, tin oxide 4 [illegible]

women employed from 5 to 12 years, X-rays of whose chests showed shadows of a reticular and micronodular type, attributed to fibrosis. The subjects were in good health and regular workers No question arises here of any tendency to tuberculosis which is so distinctive of true silicosis No estimations are given of the dust concentrations to which the women were exposed If the X-ray shadows seen are due to pulmonary fibrosis caused by dust of silicates and are indicative of the existence of silicatosis, the resulting condition does not seem to be of any particular clinical importance *E L. Collis*

aerosols of penicillin, one such case is illustrated by two serial radiographs The diagnosis of a complicating tuberculosis is often difficult and failure to find *bacilli in the* sputum is a common experience, in such cases indirect laboratory methods have been used; a sedimentation rate exceeding 20 mm. after an hour is regarded as suspicious, and with 30 mm. tuberculosis is probably *present. The occurrence of cor pulmonale* as a complication has been investigated at the Institut by F. LAVENNE, who found a close correspondence between the degree of emphysema and the electrocardiographic modifications

Methods of treatment now being applied include inhalations of oxygen under pressure along with broncho-dilator aerosols and theophylline, these relieve the dyspnoea in severe cases, mercurial *diuretics are given to remove oedema.*

Preventive measures include control of acute and subacute pulmonary infections, initial examination and rejection of unsuitable applicants for employment; change of occupation for workers found to be affected at periodical examinations Removal from the mines of all those with the micronodular stage of pneumoconiosis would be inadvisable for economic, social and humanitarian reasons. Patients with *active tuberculosis should be removed from the* mines and sent for treatment, healed tuberculosis should be kept under supervision, young workers showing signs of rapid development of pneumoconiosis should be removed from exposure to dust, older workers [illegible]

allowed to continue at work if they wish to do so. The solution of the problem is looked for in the suppression of dangerous dust by technical measures.

E L Middleton

THEVENOUX, R Etude statistique de quelques facteurs influant sur le déterminisme de la pneumoconiose des houilleurs [**A Study of Certain Factors which Influence the Development of Pneumoconiosis among Coal Miners**] *Rev Méd. Minière* Douai. 1950, v. 3, No 12, 167–89, numerous charts

This study concerns certain French coal miners who formed the material of an intensive *statistical* investigation The miners considered had worked at least 5 years in these mines and not elsewhere, had been recently X-rayed, and had no signs of tuberculosis Then they were classified according to intensity of exposure to silica dust: considerably, due to regular work on siliceous rock, slight, when only getting coal; and mixed, for between work. They were grouped according to length of work in 5-year periods. Finally, there were 325 French miners, and 291 foreigners, comprising 79 Poles, 86 Italians, 38 Spaniards, 50 Slavs and 38 Portuguese The data for these men are decidedly few for the intensive analysis here portrayed in chart after chart, varying in shape and size The author ventures to advance the *following conclusions* Age does not seem to exert any influence upon the development of silicosis Foreign miners were *more readily* and more severely attacked than French miners Certain families succumbed more readily than others; and members of the same family exhibited the same type of silicosis after similar exposure Length of exposure *is the predominant factor, and the more* it is prolonged, the less are the chances of escape Good healthy families, free from complaints and especially from tuberculosis, were far less liable to succumb, and old members of such families showed no pulmonary shadows after years of exposure. On the other hand, every member of unhealthy families tended to be attacked, even after short periods of exposure Each person seems then to present his own *individual receptivity What may be* the personal factor which prepares the way for silicosis remains unknown.

E L Collis

CAZAMIAN, P. Contribution médicale à l'étude du [illegible] de [illegible] Study [illegible] orking [illegible] *Paris* [illegible]

A study is presented of the dust risk to which miners are exposed at various processes while getting coal, and of the relation between this risk and X-ray shadows of the lungs A selection was made of 250 miners who had not worked in other mines; they were divided into 3 groups In one group the *men had been at work not* less than 20 years and suffered permanent incapacity (assessed at 40 per cent or more) on account of pneumoconiosis; this [illegible]

no medico-legal signs of [illegible] included 155 men The third group of 37 miners included serious and early cases of silicosis with *less* than 20 years of service, whose incapacity was [illegible] processes are [illegible]

So far as possible the exact period of work [illegible] process was ascertained The risk was measured by the medico-legal condition of the miners. Certain processes, such as work on props, firing shots, and conveying, seemed to be without dust risk Loading and work with picks varied in risk *according to* whether coal or rock was being handled, danger always being associated with rock work The author points out that this method of enquiry cannot be *too exact* and gives no *information* as to the chemical nature

of dangerous dust The second part of the study considers the relation between the dust hazards and the pulmonary shadows It is held to establish that work on rocks is responsible for nearly all serious and early pneumoconiosis, and most of the serious and late cases Work with picks on coal seemed to account

AYNAUD, R & BLANC, M Étude de l'état pulmonaire des mineurs des exploitations de lignite des Houillères du Bassin de Provence **[A Study of the Pulmonary Condition of Lignite Miners in the Coalfield of Provence]** *Rev Méd Minière.* Douai 1953, v 6, No 24, 17–20

Lignite, a low-grade coal, is found in Provence in a calcareous mother rock Dust created when it is worked is essentially calcareous, and hence is not harmful when inhaled Dust was collected in the workings underground and the portion below 5 microns in size was analysed for content of silica, which was found to be inconsiderable Samples of this fine dust were injected into the peritoneal cavity of rats, 100 mgm of dust in isotonic saline The reactions provoked were studied at intervals thereafter They differed in no way from the reactions provoked by any other inert dust containing no free silica

In 1945 an examination had been made of 2,459 miners by radiography, the few cases of pneumoconiosis detected were among men who had worked in other mines In the present study 3,145 miners were X-rayed without showing any change from the previous findings, 100 other miners aged 40 to 55 who

The conclusion is that breathing dusty air in the mines of the lignite-field of Provence may at worst set up after many years a slight diffuse fibrosis of no significance *E L Collis*

ALLEN, F J **Anthraco-Silicosis.** *Proc Transvaal Mine Med Officers' Ass* 1951, Sept, v 31, No 329, 27–39, 14 figs

This report deals mainly with pneumoconiosis of African coal miners in the Transvaal, where many of the workers have also been employed in gold mines

Of 15,821 X-rays of colliery workers in 1950, 94 were

lengths of service were known, 8 were positive out of 1,903 employees (0 4 per cent) Here, of 21 long-service workers with over 15 years underground, there were 10 who had worked only in coal mines, only one of these, a man with 30 years' service, was positive Variations in times of exposure necessary to produce disease in different individuals are thought possibly to be due to an association between tuberculosis and dust, but the author comments on the relative infrequency of respiratory illness in long-service colliers

The main part of the paper consists of a description of pneumoconiosis in coal miners as it occurs in South Wales For this and illustrations of pathological and radiological appearances, which are well reproduced, the author makes acknowledgment to members of the Pneumokoniosis Research Unit of the Medical Research Council and the publishers concerned There is no description of the disease as it occurs in the Transvaal *A T Doig*

DAWES, J G **A Preliminary Study of Environmental**

By means of a questionary, data about the working environment were obtained from a considerable number of collieries in various parts of Great Britain, and these data were correlated with the incidence of

matter varied over a wide range and the ash content varied little

In England and Scotland it was found that, on the whole, the incidence of pneumoconiosis varied inversely as the proportion of ash in the coal In South Wales the dominant feature in relation to

higher than that of most Welsh coals, the level of pneumoconiosis was intermediate between that of the Welsh and that of the English and Scottish pits

Amongst the South Wales collieries, from which

the most complete information on dust concentrations was obtained, there was a striking relationship between the prevalence of air-borne dust and the incidence of pneumoconiosis

In collieries where sandstone is present in the roof, its effect on the incidence of disease is clearly demonstrable *Thomas Bedford*

British Occupational Hygiene Society First Conference.
Held at the London School of Hygiene and Tropical Medicine, 2nd November, 1953. A Report by C. N. Davies, D Sc., F Inst.P, *Hon. Editor of Transactions, British Occupational Hygiene Society*

The first Conference of the British Occupational

developing the laws for securing the health, safety and welfare of more than 7 million workers Provision for occupational health in the widest sense is increasingly concerning the Government and other quarters, and the subject is viewed in a positive manner with attention directed not only to the prevention of recognized industrial diseases but also to the maintenance of full bodily efficiency, well-being and safety

* * *

Mr S A Roach, of the Pneumoconiosis Research Unit, then gave a paper on "Measuring the Worker's Environment". This dealt with pneumoconiosis in the coal industry, which is caused by the inhalation of coal dust over a long period Since the disease takes many years to develop, the working habits of the victim as well as the dust concentrations to which he is exposed are important Great differences have been observed in the proportion of the time underground which is actually spent in coal getting, according to the pit under observation. Correlation of the stage of disease with the number of years of employment is therefore inadequate because, apart from possible differences in dustiness, workers in different pits may be exposed for varying times to the highest concentrations This difficulty has been overcome by associating a dust-sampling instrument with a particular collier, selected at random, and thus

exposure

The quantity of dust inhaled is expressed in particle years per cubic centimetre (sizes between 0 5 and 5 microns) and Roach claimed that when this figure was less than 4,000 no X-ray abnormalities were detectable in 60 colliers who were examined. Abnormalities occurred in 50 per cent at over 24,000 particle years per cc. Replying to questions from Mr Braham, the speaker stated that only the finer particles penetrated deeply into the lungs; at death, up to 50 grammes of dust could be found trapped

Sir Weldon Dalrymple-Champneys, Deputy Chief Medical Officer of the Ministry of Health, stated that his Ministry is concerned with occupational hazards because persons who become ill are their responsibility, whether the malady is contracted in industry or elsewhere. General health at home may affect industrial risk, for example tuberculosis in women and children of coal miners, which has been investigated in the Rhondda Fach

Mr. H. E. Phillips, Safety Engineer of Vauxhall Motors, was interested in the accuracy of dust sampling instruments and Mr. Roach replied that various developments are taking place, including the trial of long-period samplers, a reflection of the long-term nature of the disease.

Dr Bedford referred to the difference between instruments needed for medical research and those for routine dust control The latter need not be so precise, and must give a rapid indication of engineering improvements

Dr M. E. M. Herford, Factory Doctor, felt it was necessary to carry out dust measurements under differing seasonal and weather conditions, with which Mr Roach agreed Dr. M. Goldblatt, Imperial Chemical Industries, mentioned that some dusts which accumulate in the lungs do not retain their original identity

McCallum, R. I. **Pneumoconiosis of Coal Miners in North East England with special reference to the Durham Coalfield.** *Brit. J Indust. Med* 1952, Apr, v 9, No. 2, 99–107, 2 figs [24 refs]

A radiological survey, with large films, was made of 1,468 miners employed at 8 collieries in County Durham. This number represents about 10 per cent of the total number of men in the pits. The results are analysed and presented in tables, and show a fairly widespread prevalence of lung changes due to dust, suggesting that a minimum of 3 to 6 per cent. of the men in these pits show a well marked pneumoconiosis

The survey was begun with miniature films, of which 7,937 were taken, but it was found that the detection of early changes was difficult or impossible with such films and even the classification of more advanced changes was uncertain The difficulties of diagnosis and of classification of films are discussed at length *A. T. Doig*

McCallum, R. I. **Coal Miners' Pneumoconiosis in County Durham.** *Trans. Ass Indust. Med Officers* 1953, July–Oct, v. 3, Nos 2/3, 249–51.

Although individual observers had previously pointed out the damaging effect of coal dust in the Durham coalfield, not until the Nuffield Department of Industrial Health opened a medical clinic in Newcastle was it found that pneumoconiosis was a

najor problem Radiography indicated that a mini-

not so frequent as in South Wales It may be a chance finding in a symptomless stage, or dyspnoea with bronchitis may be present, or unrelated cardiac or pulmonary disease

The causation of disability may be impossible to determine Only a small number of miners with complicated pneumoconiosis have tuberculosis, but such cases advance rapidly Many men with radiographic abnormality work away without disability, and progress is slow unless tuberculosis develops A series of 20 men, aged 35 and over, all elected to continue face-work, rather than change to less dusty work, they were too old to learn other work and earn lower wages Dust suppression as far as is possible at the coal-face is the pressing need Modern mechanization tends to increase the dustiness

E L Collis

Pneumo- ... *ish J. Med* ... *l*, 193–206,

This contribution to the Irish national tuberculosis survey tells of an investigation into the occurrence

got in Leinster mines and a soft, much less dusty, coal in Arigna. A summary is given of the pathology and symptoms of pneumoconiosis, before the findings of the enquiry are dealt with Sixty cases of simple pneumoconiosis and 18 complicated cases were discovered Five illustrations of X-ray appearances are reproduced

Only four slight cases were found among the

were hardly fit for work. A relationship seemed to exist between good feeding, good physique, careful

hard rather than soft coal, and to the period of work underground. The number of cases found is considered sufficient to indicate the presence of a serious hazard to the miners, although by no means so pronounced as that existing in South Wales.

E. L Collis

BLACK, J. **Pneumoconiosis of Coal Miners in Scotland.** *Brit. J. Indust Med* 1953, Apr., v. 10, No. 2, 101–10, 2 figs [22 refs]

This is a review of all cases of pneumoconiosis certified in Scotland under the Coal Mining Industry (Pneumoconiosis) Compensation Scheme, 1943, and the National Insurance (Industrial Injuries) Act, 1946, during the period 1944 to 1949 After discarding those with substantial exposure to dust outside coalmining and those who had worked for considerable periods in mines outside Scotland, 1,315 men remain subject to review

Pneumoconiosis was found to occur in each of the four Scottish coalfields and in all colliery districts within them Certifications showed a progressive increase from 76 cases in 1944 to 379 in 1949 Based on certifications in 1942, the increase was relatively

legislation The mean annual number of cases certified as silicosis in the period 1939 to 1943 was 4 8, whereas it was 86 5 in 1944–1949 for cases of the "silicotic" type Reasons for the increase are discussed

All coalfields and colliery districts were affected by the increase, though to a varying degree, and factors tending to lead to high certification rates in different districts are discussed Mechanization *per se* is not the only factor, others of importance being local underground conditions such as dry workings, thin seams and frequent faulting with intrusion of stone

cause of total incapacity for work

The author has no direct information on the influence of tuberculosis on complicated pneumoconiosis He has, however, studied local tuberculosis statistics and finds that certification rates of pneumoconiosis closely parallel the mortality rates for *pulmonary tuberculosis* in the same areas This is true both for simple and complicated pneumoconiosis and the author submits that if there is any aetiological relationship it is a general one and not restricted to complicated pneumoconiosis The period of risk is, however, a material factor, and, as the group comprising brushers and stone miners showed the highest incidence of complicated pneumoconiosis, exposure to stone dust may also be of account; in

adequate and clearly set out] *A. T. Doig*

FLETCHER, C. M **Epidemiological Studies of Coal Miners' Pneumoconiosis in Great Britain.** *Arch. Indust. Health.* Chicago. 1955, Jan., v. 11, No 1, 29–41, 8 figs [27 refs]

The prevalence of pneumoconiosis in the coal fields of Great Britain was largely determined by the number of cases of the disease certified for purposes of compensation. In 1931 coal miners were first granted compensation under the Workmen's Compensation Act, for silicosis, and compensation was restricted to those miners working in silica rock, a comparatively small proportion of those employed underground in coal mines Subsequent legislation extended the benefits of compensation to miners certified to be suffering ... this arose from evidence from ... rge- ... rch ... in ... d a

... mines, with steam-coal mines occupying an intermediate position Dust measurements showed a relationship between total dust concentration and the ... and chemical analysis ...

although it was concluded that the dust in ...

and has been carried on since then by the National Coal Board By the end of 1951 nearly 30,000 cases of pneumoconiosis had been certified in South Wales and over 7,000 in the rest of the country In 1945 the Medical Research Council set up a special Pneumoconiosis Research Unit in South Wales which has studied many aspects of the problem

Attempts were made to study the relationship between disease incidence and dust exposure and to discover, if possible, "safe dust levels" to which men might be exposed without developing serious pneumoconiosis The methods are described They in... by radiographic examina-

... ommunity ... steam-coal ... mines in ... England

Preliminary results showed a relationship between dust exposure and the proportion of men with simple pneumoconiosis, they suggest that there may be a different response to the dust of different kinds of coal, but estimates of dust exposure during the period of "production" of pneumoconiosis were too inaccurate to enable any final conclusion to be drawn or to give

GOUGH [this *Bulletin*, ... dency to coalesce into massive fibrosis Tubercle bacilli and histological *signs characteristic of tuberculosis* may be found in 40 per cent of these cases, and in the remaining 60 per cent. the tissue changes are closely *comparable* with those in which tubercle bacilli are found

the progression rate of established cases of massive fibrosis is the same This strongly suggests that some other *agent is responsible for the initiation* and development of massive fibrosis The category of simple pneumoconiosis has an important influence on the attack rate of tuberculosis and of massive fibrosis, the latter has not been seen to appear on a background ...

proved, but a future follow-up of the survey of ... graphic evidence of tuberculosis and massive fibrosis ... in Rhondda Fac... ... ntion ... and *tuberculosis control in mining communities*

E. L Middleton

DAVIES, I. ***A Pilot Investigation into the Occurrence of Pneumoconiosis in Large Power Stations in South Wales.*** *Brit. J. Indust. Med.* 1953, Apr., v 10, No 2, 111–13

As it seemed that there was exposure to considerable quantities of dust, a radiological survey of men employed in 4 large electricity generating *stations* was arranged; *572 volunteers (50 per cent.)* were examined out of a total of 1,138 employees; 57 were found to have pneumoconiosis, but all of these had previously worked underground in coal mines, and the severity ... the length of the ... had ... *lence* ... *years* ... In and 31 *for over 20 years* in the ... spite of the negative findings, the author believes that there exists a pneumoconiosis risk in these *stations*,

of exposure probably being too short to produce pneumoconiosis No estimations of the dust content of the atmosphere or of the chemical or physical nature of the dust are given *A T. Doig*

TYRER, F. H, GREGORY, J & CARSON, M B. **Pneumoconiosis in Gasworkers.** *Trans Ass. Indust. Med. Officers* 1953, July–Oct, v. 3, Nos 2/3, 246–9 [10 refs]

Previous studies have left some doubt how far the dust to which gas workers are exposed causes pneumoconiosis A new study is now recorded in which 86 gas workers (74 retort-house workers and 12 coke screeners) with more than 10 years' employment were contrasted with 104 meter inspectors and district gas fitters Ninety per cent of the coke dust consisted of particles less than 1 6 microns in diameter In the retort house there were 25 to 75 particles per cc; and in the coke screening plant 600 to 1,300 Of the 190 persons examined only 3 showed definite signs of pneumoconiosis, and all 3 were employed on the coke screens No single case of pneumoconiosis was found among the retort-house workers The dust contained less than 1 per cent of free silica The dust exposure at the coke screens lay above the National Coal Board's upper limit of safety—850 particles per cc

to succumb to tuberculosis, not dealt with in this study, seems to be a special characteristic of exposure to silica dust] *E L. Collis*

SAUZEAT, H L'appréciation de la nocivité des chantiers [**Appraisal of the Health Hazard in Mine Workings**] *Rev Méd Minière* Douai 1950, v 3, No 12, 155–9

The paper comprises a general discussion of the silicosis hazard in coal mines, with a consideration of the nature of dangerous dusts, the formation, propagation and control of dust, measures of protection, and classification of risks At the dust laboratory which the author directs, dust estimations are made by means of the thermal precipitator The ground in which work is done is described as "rock" when the rock content of free silica may be as high as 60 per cent In ground classed as "coal" the maximum free-silica content is 5 per cent A dust count of 100 particles of free silica per cc. has been regarded as indicating a dangerous concentration *Thomas Bedford*

CARTWRIGHT, J & NAGELSCHMIDT, G **Interim Report on the Size of Dust in Lungs of Coal**

This paper

dust particles

discusses the

Both lung s

digested lungs were examined under the optical microscope Four different methods of digestion were

shape Adjusted for lung retention [BROWN *et al*, *ibid*, 1950, v 25, 1254] the agreement is good† *J McK Ellison*

EVANS, W D **The Petrology of Mine Dusts in the South Wales Coalfield.** Reprinted from *Proc South Wales Inst of Engineers* 1948, v 64, No 2, 110–38, 8 pls & 4 figs [42 refs] Discussion 139–44

the Monmouthshire and South Wales Coal Owners' Association The air-borne dust was collected over the greater part of the working shift, with a Soxhlet Thimble apparatus placed in the centre of the approach roadways, 30 feet from the coal-face and 4½ feet above floor level, the collected dusts represent, therefore, a fair sample of the dusts inhaled by miners during a working shift. The slip-dust samples were collected by brushing or scraping from slip-faces The technique of petrographic examination was specially devised by the author to overcome the difficulties in examining particles under 2 microns in diameter, this involved the

*p. 21. †v. II, 379

extraction of individual particles not identifiable with the petrological microscope, for study of the refractive index The identities of 14 minerals are recorded

Three types of quartz are described, the identification of secondary quartz matter in the coal seams may be of special significance in relation to pneumoconiosis, since the coal substance *itself* contains dispersed quantities of this easily soluble silica. Kaolinized matter was found widely distributed in the dusts examined and, since they can release alumina under certain conditions, their presence may exert a depressive effect on the action of free silica Of the air-borne dusts examined particles of coal formed more than 55 per cent of each sample Attempts were made to assess the various maceral ingredients, the results obtained support the view that fusainous bands in coal are the principal source of the air-borne dusts

Outstanding features of the dusts examined were the persistence of coaly matter in all sizes down to, and beyond, the limiting resolution of the microscope the variation in size and concentration of quartz particles, with abundance of these under 2 microns only when associated with mechanized operations, variability in the size range of micaceous minerals, and fairly evenly dispersed size ranges of kaolinized minerals In general, samples from workings in coals of about 15 per cent or less volatile content showed quartz in excess of micaceous and kaolinaceous mineral matter, but there were exceptions to this, and it was concluded that the quartz content of air-borne dusts did not appear to bear significant medical comparison with the rank of coal

Summing up the evidence of this survey the author concludes that the quantity of quartz or its associated minerals or both in air-borne dusts in the significant size range is always small compared with the quantity of coal By comparison of ash contents of English and Welsh coals it would seem logical to suppose that the inorganic content of air-borne dusts from coal in all areas would compare fairly closely with those of South Wales, yet such a comparison is not matched by equivalent established incidences of pneumoconiosis "This anomalous state of affairs naturally lends support to the theory that the disease is directly related to excessive concentrations of air-borne dust" From an intensive examination of the shape factor of air-borne dusts it seems evident that, apart from shards of Group I quartz, there is no close comparison between it and the incidence of the disease It is noted that the air-borne dusts contained no grains of fibrous "sericite" to support the theory of W R JONES [this *Bulletin*, 1933, v 8, 727], but, by extraction of lung tissue with concentrated nitric acid, fibrous materials were obtained The results of the survey apply to the conditions met with by workers at the coal-face and have no direct bearing on the incidence of pulmonary disease among hard-heading workers It may well be that the metamorphic changes associated with increase in rank of coal, and the production of increased silicification of the sediments associated with the seams (Cox, *Proc S W. Inst Eng*, 1938, v 54, 161) may bear a significant relationship to the incidence of the disease in those workings which involve the removal of such strata and among workers in hard-headings

E. L. Middleton

*v I, 71

EVANS, W D. **Coalminers' Pneumokoniosis.** Reprinted from *Colliery Engineering* London 1951, Nov & Dec, v. 28, Nos 333 & 334, 15 pp, 16 figs [17 refs]

The author approaches the problem of the aetiology and pathogenesis of coalminers' pneumoconiosis from a petrological study of coal mine dusts, especially of those which appear to be harmless. As a result of his investigations he seeks to establish that certain kinds of coal, as distinct *from* other constituents of mine dusts, contain "substances which would inhibit pathogenesis in the lung and also suppress the activity of tubercle bacilli"

In the discussion of constituents of mine dusts regarded as important quartz is accepted as the principal cause of *classical silicosis* Two kinds of quartz are distinguished · Group I quartz, characterized by freshly formed conchoidal fractures; and Group II quartz, including all other forms Group I quartz is considered as probably of more importance in the development of fibrosis, and as some indication of the general toxicity of the mine When the quantitative variations in inorganic constituents of mine dusts are considered, it is evident that minerals such as quartz are present in quantities too small to cause the damage found in the average miner's lung in South Wales, and the bulk of evidence so far considered strongly supports the view that the total quantity, and not the quality, of dust is the cause of pneumoconiosis among the coal workers This quantitative theory is not borne out, however, by correlation of the total quantity of air-borne dust, as in a number of collieries during 1940–45, and the incidence of pneumoconiosis over the same period. *It is suggested* that the quantitative aspect becomes apparent only when it is related to the quality of the coal particles in the air-borne dusts

Previous surveys by the author [see above] had revealed a possible relationship between the ingredients of coal—the so-called *macerals*—and the disease; these macerals can be grouped as "*V-coal*", consisting of substances which predominate in vitrainous and clarainous bands of coal; "*F-coal*", derived from fusainous bands in coal, and with a low H . C ratio, and "*D-coal*" derived from durainous bands of coal. "It has been found that when an airborne dust is composed of 50 per cent V-coal and the remainder consists of F-coal and D-coal the recorded incidence of disease is practically nil On the other hand, when the dusts are dominantly composed of Va-coal [an opaque variety of V-coal] and *F-coal*, as in the case of most South Wales localities, the dust is dangerous, and its hazard value is then determined by the concentration of respirable particles per unit volume of air. All shades of toxicity

can be recognised by means of this form of maceralogical analysis." It is claimed that V-coal and

of coal in the seams

A method of assessing the quality of coal mine dusts has been developed by using a solvent, such as methanol, to extract the brown substances released from the coal and adsorbed on strips of

placed on a culture of *B subtilis* in a Petri dish The dominant substance in the abstracts has been termed "*Vitricin*" (British Provisional Patent No 15025) from its common associations with all types of vitrainous parts of coal seams A high concentration has been found in certain lignites, but decreasing quantities in coals of increasing rank A weak extract of Vitricin, obtained from lignite, was tested in the laboratories of Professor Jethro GOUGH against the human type of tubercle bacillus H37Rv and it was found to inhibit its growth Investigations are proceeding for the mass extraction of Vitricin from special forms of lignite and coals of low rank, and to relate them to the retardation of tuberculosis, characteristic of pneumoconiotic lungs. Tests for the possible use of Vitricin as an antibiotic against tuberculosis are in progress There is some evidence that it is non-toxic and "could be administered in large doses to combat pulmonary disease" *E L Middleton*

FLETCHER, C M, EVANS, W D **Coalminers' Pneumokoniosis.** [Correspondence] *Colliery Engineering* London 1952, Mar, v 29, No 337, 91-3

In these letters Dr Fletcher comments on the articles by Professor W David Evans on Coalminers' Pneumokoniosis [see this *Bulletin*, 1952, v 27, 565] and Professor Evans replies

The basis of much of the apparent difference of view appears to rest on the acceptance of evidence on dust concentrations in coal mines, and of the incidence of pneumoconiosis, and the relationship between the two Dr Fletcher maintains that the data on which Professor Evans bases his theory about the relative toxicity of different types of coal do not take sufficient account of the quantitative changes which have taken place between the dust conditions which existed in the coal mines at the time when the disease was being *produced* in the miners, and the conditions which existed long afterwards, when the atmospheric dust estimations were made and the *prevalence* of the disease was determined. Dr.

of relating present dust conditions to past dust

hypothesis that the concentration of respirable

prevalence of pneumokoniosis has been very much greater in South Wales than in other coalfields, and the reason for this is not certain". Dr Fletcher agrees with Professor Evans that there is a strong association between the incidence of disease and rank of coal, but he does not accept the explanation for exceptions to this association given by Professor Evans, that they might be due to the presence of V-coal particles in the dust (which Professor Evans claims have a favourable influence on the pathogenesis of pneumoconiosis), this is an instance of an exception to the qualitative theory of Professor Evans An exception to the qualitative theory, supported by Dr Fletcher, is cited by Professor Evans in the case of a Whitehaven coal mine, where Dr Fletcher had confirmed that "dust conditions have been very severe for at least ten years, but there was good presumptive evidence for there being no pneumokoniosis among the men exposed to these conditions"

[It is perhaps not unfair to regard the principal difference of opinion expressed in the correspondence as one of emphasis on the importance of the quantitative, as against the qualitative, influence

research and practical investigation in the mines There is great hope that integration of this kind is taking place]

E. L. Middleton

*See above.

POLICARD, A., COLLET, A. & GILTAIRE-RALYTE, Lucette. Étude au microscope électronique des poussières de houille renfermées dans les poumons des mineurs au charbon **[Electron Microscope Studies of Dust in the Lungs of Coal Miners]** *C.R. Acad. Sci.* 1953, Apr. 13, v. 236, No 15, 1458–60.

By electron microscopy the authors have already shown that silicotic lungs contain particles of silica of which more than half are less than 0 1μ in diameter (*C.R Acad. Sci.*, 1952, v. 235, 224). They have now

Percentage of particles

Particles less than μ	T Cevennes	Ta Loire	B Lorraine	C (Silicotic) Lorraine
0 1	0	4 2	0	57 7
0 2	2 2	20 7	36·8	88·7
0 5	43 8	58	89 5	93 1
1	80	82 1	96	97 8
2	100	100	100	100

Particles greater than 2μ were not counted *For all practical purposes the anthracotic lungs did not contain particles of less than 0·1μ.* These findings correspond with the measurements made by WALKENHORST of dust in air in the neighbourhood of drilling machines [*this Bulletin, 1953, v. 28, 549*].*

Charles Wilcocks

HASSELT: INSTITUT D'HYGIÈNE DES MINES Comm V. Communication No. 118 Nocivité des empoussiérages dans les chantiers d'abattage de charbon **[Dust Hazards in Coal Mine Workings]** [HOUBERECHTS, A., DEGUELDRE, G. & LAVENNE, F] 1954, June 17, 42 mimeographed pp , 12 figs & 2 graphs (1 coloured) [27 refs]

Various criteria have been put forward for the assessment of the hazards to health due to air-borne dust. The authors have sought an expression of the relative harmfulness *of a dusty atmosphere which* would agree with experimental results

In different coal mines they have sampled the air with (a) Soxhlet filters so as to ascertain the mass concentration of the dust and by subsequent analysis to determine the proportion of *silica (total and free)*; and (b) a thermal precipitator to ascertain the numerical concentration of dust particles and the particle size distribution

... made on 11 working faces with ... rt The ... iscussed ... iat have ... hazard ... t is rich

3 microns in size. In evaluating the dust hazard at coal faces the authors have calculated the volume of particles smaller than 3 microns

The relative danger of atmospheres thus estimated has been compared with that calculated *on the basis* of other criteria, depending on the total weight of dust particles in a given volume of air, or on the number of *particles* within various ranges of *size*, or the mean diameter of particles within a given size *range*.

It is concluded that in coal mines where the pro- ... the criterion

about 1 m. per sec. ... requirements of mine ventilation often make it necessary for this speed to be exceeded

For workings mined intensively the superiority shown by the "Panzer" as a means of rapid dis-

BOUCHER, R M ... *le problème* ... minière. ... **Problem o** ... **Industry]** ... 239–48, 6 figs [35 refs]

While describing the history of the recognition of silicosis as a disease due to dust, and capable of existence independent of organic infection, *the author* points out that too rigid a distinction should not be drawn between the various pneumoconioses since such differences as exist may be of degree rather than of kind

in ... do ... order of their solubilities ... fibrogenic effect from amorphous colloidal silica is emphasized, this has been masked, in *the past*, by ... solubility ... lution ... oncen- ... es are ... v 29, † ... lution ... anized ... ticles, ... rhaps which must be greater than 0 1 micron, to act catalytically in this way.

*p. 312. †p. 93

The theory is proposed that the wide range of fibrogenic power which is found with different dusts when they are inhaled as particles about 1 micron in size, running from nearly zero for coal to a high value for quartz, is associated with the presence at the surface of the particle of broken resonance bonds between atoms which were separated when the particle was created, such sites on the surface of the particle may be able to initiate the reaction with cells of the organ in which fibrosis develops

Support for this theory is given by a correlation between fibrogenic power and a coefficient expressing the silica-oxygen ratios in 30 silica minerals tested biologically by L U GARDNER There are also some suggestive experiments by HOUNAM [this *Bulletin*, 1952, v 27, 942] which show how the surface density of negative charge on suspensions of mineral particles

nothing, nor could he have anything in the present state of knowledge, to say about this Perhaps his

C N Davies

GÄRT

The workers of a large carbon black factory were examined by mass radiography in order to find out whether pure carbon produced any lung changes In the factory flame carbon and gas carbon were produced by burning anthracene oil alone or mixed with town gas The primary size of the particles was

showed a number of doubtful pneumoconioses, and on re-examination with full-size X-rays 13 distinct and 18 initial pneumoconiosis cases were found, although only two-thirds of the men recalled turned up for examination Most of the certain, and one-half of the initial, cases had over 10 years' dust exposure, but, of the men recalled, over half with normal X-rays had also over 10 years' dust exposure

advanced cases Apart from slight shortness of breath there were no other symptoms of disease

It is concluded that mass radiography can be used in a survey of this type if the number of men recalled for full-size pictures is large The discrepancies

G Nagelschmidt

POLICARD, A **The Mechanism of Dispersion of Coal Particles in the Lungs of Miners.** *Brit. J. Indust. Med* 1952, Apr, v. 9, No 2, 108–11.

The histological and physiological mechanisms of dust transportation in the lungs are difficult to elucidate. Conclusions based on animal experiments cannot be applied to man, and there are problems even in the study of human lungs, the most serious being that when the thorax is opened the lungs collapse and this upsets normal relationships. Policard however, had the opportunity of studying the lungs of a man aged 40, a coal miner for 20 years, who died from asphyxia while in good health The presence of lung oedema prevented collapse and so avoided displacement of pulmonary structures

The alveoli contained numerous alveolar cells stuffed with coal particles, free particles being absent probably because they had been carried away by the transudation of oedema fluid. These cells may move from the alveoli by two routes. In one case they may, partly at least by their own movement, penetrate the walls of the alveoli and enter the periphery of the peribronchial and periarterial sheaths where

their own accord or translated passively by the

epithelium, reticulin fibrosis follows and bronchiolar and alveolar elastic tissue is obliterated Lung parenchyma not involved in dust aggregation or focal [illegible] shows no alteration in the elastica but [illegible] is associated with [illegible] ... run ... ies ... ers considerably from peri[illegible]

... dust-laden phagocytes accumulate in the interstitial tissue of the respiratory bronchioles and, in the short sections between the alveoli, knobs of dust cells appear to project into the lumen of the respiratory bronchiole Later the dust lesion becomes compact, many alveoli are obliterated and muscle fibres may be enveloped by the condensed mass of dust phagocytes. A general inverse relationship seems to exist between the degree of focal emphysema and the amount of smooth muscle detectable in the walls of the affected airways.

Results of experiments on the recoil of elastic tissue tend to minimize its importance in the recoil mechanism of the lung, MACKLIN (*Physiol Rev.*, 1929, v 9, 1) and MILLER (*Amer. Rev Tuberculosis*, 1921–22, v. 5, 689) concede that smooth muscle plays an active part in the expiratory phase of respiration. The main function of the elastica is that of a limiting and supporting structure, preventing over-expansion of the lung parenchyma. There seems no reason to doubt that expiration is mainly due to contraction of bronchial and bronchiolar smooth muscle, but relaxation of the thoracic cage and diaphragm may assist [illegible] compression of the lung. The [illegible] interpreted [illegible]

ments o[illegible] the affected area [illegible] expansion in the [illegible] the traction of inspiration; the tension normally expended on these alveoli is transmitted to the respiratory bronchioles which are thereby subjected to a slightly increased inspiratory traction In many cases aggregation of dust is associated with atrophy of the bronchiolar smooth muscle; the normal expiratory shortening and constriction of the respiratory bronchioles do not therefore occur The result of these mechanical disturbances is dilatation of the respiratory bronchioles, that is, the development of focal emphysema; when smooth muscle is present in normal amount focal emphysema is usually absent Damage to the pulmonary elastica is not a major factor in the development of focal emphysema Dilatation of respiratory bronchioles is not associated with the simple silicotic nodule because of the constricting effect of the excessive fibrosis

E L Middleton

HEPPLESTON, A G. **Changes in the Lungs of Rabbits and Ponies Inhaling Coal Dust Underground.** *J. Path & Bact* 1954, Apr, v 67, No 2, 349–59, 12 figs on 4 pls. [Numerous refs]

This paper reports the pathological changes found in the lungs of rabbits kept underground in coal mines, the cages being placed in the return airway 50 yards from the coal face. Some of the rabbits were exposed only during the coal-getting shifts and therefore predominantly to coal dust, while others were kept underground throughout the whole 24 hours, exposed both to coal dust and to stone dust arising in the operation on the other two shifts. The total period of exposure varied from 6 to more than 36 months In addition, the lungs of pit ponies were also studied but without any precise information as to the nature and duration of their dust exposure

In all the animals there were focal accumulations of dust, chiefly around the respiratory bronchioles and alveolar ducts There was no fibrosis in relation to these deposits of dust, but in some rabbits there was a mild focal type of emphysema in relation to the dust foci. There was no difference between the rabbits exposed only to the coal-getting shift and those exposed throughout the 24 hours The author concludes that since men exposed to the same dust as that to which the rabbits were exposed may develop disabling pneumoconiosis, the absence of fibrogenic effect of a dust in animals does not indicate that the dust is innocuous to man, and that the apparent anomaly [this *Bulletin*, 1954, v. 29, 632] can be* resolved by relaxing the emphasis on fibrosis as the only important pulmonary reaction to dust

C. M. Fletcher

WELLS, A L **Pulmonary Vascular Changes in Coal-Worker's Pneumoconiosis.** *J. Path. & Bact* 1954, Oct, v. 68, No. 2, 573–87, 21 figs. on 8 pls [41 refs.]

The anatomical changes observed in the pulmonary vessels at 388 autopsies on coal-workers from the South Wales coal-field are described. Lesions were found of an obstructive and destructive nature, slight and infrequent in 181 cases of simple pneumoconiosis, but severe and fairly widespread in 136 cases of massive pneumoconiosis and in 71 of active tuberculosis Varying degrees of enlargement of the bronchial arterial system were found. Occasionally, in cases with severe lung fibrosis, there was a development of large broncho-pulmonary arterial shunt Changes, such as are usually accepted as due to ageing, were more pronounced than age would account for throughout all the cases The various stages leading to obliteration of the pulmonary vessels, most definite in massive fibrosis and in tuberculous cases, are carefully described The changes included thinning of the wall of the arteries by the adjacent fibrotic process, with resulting ulceration of the intima The overall loss of vessels was sufficient to provoke pulmonary hypertension. Peripheral venous thrombosis, leading to cardiac failure, was seen in many cases. Certainly varying degrees of bronchial arterial enlargement occur in severe coal-worker's pneumoconiosis, especially in the presence of active tuberculosis The relation of abnormal broncho-pulmonary shunts to the development of cor pulmonale and heart failure cannot be decided definitely

*p. 90.

The changes observed are described under the headings of non-specific changes, specific pulmonary arterial changes, thrombotic changes, and bronchial arterial lesions At each stage the findings are illustrated by a series of excellent illustrations of the microscopic appearances Of particular interest are figures 3 and 4 contrasting the pulmonary arteries of normal and massive pneumoconiotic lung after injection *E L Collis*

ATTYGALLE, Daphne, HARRISON, C. V, KING, E. J. & MOHANTY, G. P **Infective Pneumoconiosis. I. The Influence of Dead Tubercle Bacilli (B.C.G.) on the Dust Lesions produced by Anthracite, Coal-Mine Dust, and Kaolin in the Lungs of Rats and Guinea-Pigs.** *Brit. J Indust. Med.* 1954, Oct., v. 11, No 4, 245-59, 39 figs [31 refs]

lous infection The experiments recorded here were designed to study the influence of dead tubercle bacilli upon experimental pneumoconiosis in rats and guineapigs

Dusts and *killed* BCG bacilli were given alone and in combination by the intratracheal route to rats and guineapigs The dusts used were anthracite alone, anthracite with 20 per cent shale, and kaolin The dusts and the killed bacilli alone produced only slight reticulin fibrosis in the animals' lungs, but *when each of the dusts was injected together with* killed BCG, there was a considerable nodular fibrotic reaction with the laying down of collagen fibres This fibrotic reaction reached a maximum after 6–8 months and then regressed, so that after a year there was only slight residual fibrosis The profusion of bacilli in the lesions also diminished as the lesions regressed. No difference was found between the results in rats and guineapigs *C M Fletcher*

HASSELT INSTITUT D'HYGIÈNE DES MINES Gén /203 Communication No 106 Service médical Épreuves fonctionnelles pulmonaires chez des houilleurs au travail **[Functional Respiratory Tests in Coalminers at Work]** [LAVENNE, F & BELAYEW, D] 1953, Apr 27, 33 mimeographed pp [20 refs]

The vital capacity, the maximum ventilation per minute and the apnoea period were measured in 205 *men, who had spent between 5 and 46 years at work* 1,350 m below ground The tests were made immediately after work at the mine medical centre, and the men were also given full radiological and electrocardiographic examinations

The results were classified according to age and according to the radiological picture Sixty (30 per cent.) of the men showed various degrees of pneumoconiosis The vital capacity and ventilation results were corrected to 37°C. and saturated vapour pressure

statistical difference between the vital capacity of normal and pneumoconiotic miners The maximum breathing capacity (MBC) of those under 50 years (105 to 114 l /min) was less than the minimal values of 119 to 145 l /min expected from Wright's data, but at ages over 50 years the results (MBC 99 to 102 l /min) were comparable with Wright's figures The authors believe the lower results to be due to their limitation of the frequency of respiration to 60 respirations per minute The maximum ventilation rate was as great among men with pneumoconiosis as among normal men The voluntary apnoea period was longer among normal persons and men with early pneumoconiosis (54 seconds after inspiration, 17 to 20 after expiration) than among more severe cases (40–47 sec after inspiration, 11–15 sec *after expiration) but the authors emphasize that,* before conclusions are drawn, the work should be repeated with a more rigorous technique

Of 54 workers who showed definite pulmonary deficiencies, 18 had confirmed pneumoconiosis The percentage of tests deviating markedly from the mean was no greater among the 60 pneumoconiotics than among the 145 men with little or no sign of pneumoconiosis Abnormal results were due to sibilant râles, obesity or cardiovascular troubles, since those attributed to the fibrotic condition of the lung were rare

To determine whether pneumoconstriction due to atmospheric dust was present, the men were further divided according to the severity of dust contamination in the inspired air The incidence of sibilant râles, the vital capacity and ventilation rate did not *differ between the two groups*

The authors conclude that, although these results on the pulmonary function among men at work, whether suffering from various degrees of pneumoconiosis or not, may appear to be over-optimistic, they do correct the over-pessimistic reports which have been issued on invalided or sick pneumoconiotics *Barbara Tredre*

HASSELT INSTITUT D'HYGIÈNE DES MINES Communication *hors-série* *Prédiction du volume* pulmonaire résiduel à partir de mensurations

Residual air is that left in the lungs at the end of maximum expiration Several different methods have been used for measuring residual air. The present

			Code
			0/-
Normal Range			
Abnormality simulating Pneumoconiosis but not caused by Dust			x/-
PNEUMOCONIOSIS	Category	Appearance	
Simple (Pneumoconiosis with discrete opacities)	1		1
	2 < Pinhead p, Mixed m, Nodular n		2p, 2m, 2n
	3 < p, m, n		3p, 3m, 3n
Complicated (Pneumoconiosis with coalescent or massive shadows)	A		3A 2/1
	B		3B 3/3
	C		7C 4/5
	D		7D 5/4

Diagram of new International Roentgenological Classification of Pneumoconiosis

is given of the procedures followed and the conclusions reached Observer error in the classification of radiograms is a serious problem requiring further study. It might be reduced to some extent by the use of standard reference films and by duplicate reading Wider adoption of the new International Classification of Pneumoconiosis was urged.
E L Middleton

FLETCHER, C. M. & OLDHAM, P. D. **The Use of Standard Films in the Radiological Diagnosis of Coalworkers' Pneumoconiosis.** *Brit. J Indust. Med.* 1951, July, v. 8, No. 3, 138–49, 4 figs.

Radiographs are used as the chief means for diagnosing pneumoconiosis for purposes of compensation. Hence accurate reading of X-ray films is a first requisite But experience has shown that different observers may classify the same film differently or even that the same observer may classify the same film differently at a second view. The suggestion made that the use of standard films for comparison ... differences. The study here ... this suggestion

(1) a small number ... (2) more ... (3) opacities markings clearly visible, with the lung markings still visible, profusely scattered through both lung fields obscuring the lung markings; and (4) the lung fields filled to capacity with typical opacities. No use was made of such terms as reticulation, stippling or nodulation Four standard films were selected exemplifying the lower limits of these categories. As each film to be classified was placed on the screen, the observer asked for the appropriate standard film, which was then placed on an adjoining screen; a view of two standards was often needed before a decision was made Experienced and inexperienced observers viewed 120 chosen films.

The results were submitted to careful scrutiny and statistical tests. The use of standard films enabled most of the observers to improve their accuracy. The most experienced were only assisted when viewing normal films. These observers achieved reasonable accuracy with abnormal films without standards Less experienced observers achieved considerable improvement by using the standard films when viewing abnormal films. Progressive massive fibrosis is responsible for most cases of serious disablement, and is thought seldom to arise with less than category 3. Hence accurate diagnosis of category 2 is of great importance, since a man in that state should be withdrawn from the dust hazard. Of course much depends upon radiographic technique; a different technique used on the same day may place the subject in a different category. The greatest consistency was achieved by 4 experienced observers reading films in consultation with standard films These standard films appear able to guide wholly inexperienced observers to make a classification with an accuracy approaching that of more experienced observers.
E. L. Collis

COCHRANE, A. L, DAVIES, I & FLETCHER, C M. **"Entente Radiologique". A Step towards International Agreement on the Classification of Radiographs in Pneumoconiosis.** *Brit J Indust Med* 1951, Oct, v. 8, No. 4, 244–55, 4 figs [31 refs]

Expert reading of radiological appearances is useless unless there be an agreed system of description and classification, especially with regard to the pneumoconioses With this need in mind an international scheme was put forward at the third international conference held in Sydney in 1950 This scheme is here presented as appendix 2 It is used when studying anthracosis in South Wales But a somewhat different system has been in vogue at Douai in the coal mines of North France A joint study is now reported in which two large groups of films from the two coal fields were classified by French and British experts, using both systems of classification The two schemes were found similar in most respects But certain important differences emerged A comparison was made of French and British independent readings by numerical and morphological classifications

After discussion, a final system of classification incorporating the essential features of both French and British systems was agreed upon, it appears as appendix 1 The advantages of this agreed system, which is now being given a trial by doctors working in France, Belgium and Holland, as well as in South Wales, are discussed The agreed scheme makes formal provision for the description of morphological types of simple pneumoconiosis The point is stressed that standard films should be used to enable observers who are inexperienced to approximate their readings with those of experts To this end standard films are kept at Cardiff and at Douai, such standard films should also be sent to other workers to ensure that the classification is correctly used Agreement must be achieved concerning the exact meaning and use of such terms as. small or large mottling, pin-head, micro-nodular, nodular, cobweb, angel wings, and *pseudotumorale* They should not be used in a basic classification, and "reticulation" should also be avoided Similarly, "exaggeration of linear markings" and "generalized arborization" are too uncertain as descriptive terms An important difficulty which remains to be resolved is the distinction between localized shadows due to active or inactive tuberculosis, and those due to the early stages of massive fibrosis Only follow-up studies can help in this matter

E L Collis

BALGAIRIES, E, AUPETIT, J, DECLERCQ, G, FOUBERT, P, JARRY, J J & NADIRAS, P Présentation d'une classification des pneumoconioses **[Presentation of a Classification of Pneumoconiosis]** *Rev Méd Minière* Douai 1952, v 5, No 17, 13–34, 3 figs on 3 pls & 2 text figs [17 refs]

This is an account from the French point of view the efforts by the French doctors at Douai and the eumoconiosis Research Unit at Cardiff to produce internationally acceptable X-ray classification coalworkers' pneumoconiosis The details of this k have already been published in English [this *etin*, 1952, v 27, 341] he reviewer recently attended a conference in at which representatives from Belgium, France, any, Great Britain and Holland provisionally ted the "Cardiff-Douai" classification after minor modifications]

A L Cochrane

G Deutsche Begutachtung von Staublungen-en nach der internationalen Klassification Abanderungsvorschlag zur internationalen sification **[German Assessment of Pneu-niosis X-Ray Films according to the Inter-nal Classification]** With a Foreword by V. RMANN *Beiträge z Silikose-Forschung* No 18, 1–26

erent classifications of silicosis and, later, pneumoconiosis based on radiography are reviewed, and the new Pneumoconiosis Research Unit (P.R.U.) classification which was adopted with some minor modifications at the Sydney Conference is described in detail The paper then gives the results of an attempt by 6 experienced German radiologists to read 150 films submitted by P R.U. in terms of this classification The readings were done first without and later with the aid of a series of standard films, also distributed by P R.U

The results are given in great detail in Tables and are evaluated statistically. There was not much difference in the results whether or not the standard films were used, the general agreement was of the order of 60 per cent. but discrepancies exceeding one stage were rare Most of the discrepancies concerned, as was to be expected, were in the earliest stages

In the paper certain modifications of the classification are suggested These are mainly a full description of the basis of simple pneumoconiosis for the complicated stages and separate descriptions of the right and left lung

G Nagelschmidt.

BELAYEW, D Le dépistage des pneumoconioses dans les mines belges Techniques radiologiques et standardisation de l'anamnèse professionnelle préconisées par l'Institut d'Hygiène des Mines à Hasselt **[The Detection of Pneumoconioses in Belgian Mines. The Technique of Radiology and Standardization of Industrial Classification recognized by the Institute of Hygiene in Mines at Hasselt]** *Rev Méd Minière* Douai 1950, v 3, No 12, 160–66

The value of radiography in detecting and watching the progress of dust troubles in the lungs is undoubted; but in order to obtain the best value it must be used with a standardized technique and a standardized apparatus This article is concerned with setting forth the practice followed in Belgian coal mines The miners are exposed to two forms of dust, that of coal and that from the rocks, usually siliceous, which have to be removed to allow access to the coal Everything associated with the X-ray exposure must be so standardized that films taken after intervals, perhaps of years, may be fairly compared for clearness of definition and depth of colour Procedure for developing the film must be kept exactly the same Finally, after the taking of the picture has been fixed, the shadows seen must be classified and named on an agreed plan, and the letters used for classification in the Belgian mines are instanced Nevertheless, we know that the same observer may classify a film differently at a second or third reading Tomography is used and found a great aid when determining the contours of a tuberculous lesion Finally, a method is presented for picturing the industrial history of each miner; each process has its own indicator, which appears in black for coal or red for rock work, for each

*See above

year of work an indicator is added to his industrial picture. Thus a glance at the picture tells the initiated just at what work, and for how long, any man has been employed.

E L Collis

BELAYEW, D. La tomographie dans l'anthraco-silicose. **[Tomography in Anthraco-Silicosis]** *Arch. Belges Méd. Sociale, Hyg., Méd. du Travail et Méd. Légale.* 1951, May–June, v. 9, Nos. 5/6, 197–9.

The value of tomography was tested with 200 Belgian coal miners. The attention paid to the exposure of the films is explained, regard being had to the corpulency of the subject. The shadows were more opaque, and the distribution of the nodules, small and large, in cases of pneumoconiosis was more extensive than is apparent in ordinary X-ray films. Often by following through the thickness of a fibrous opacity it is possible to detect early signs of tuberculous infection The existence of voluminous nodules and coalescing areas is frequently brought to light by tomography, which is often wanted to demonstrate the existence of a cavity hidden either by part of a fibrous mass or by a pleural thickening. Several times a diagnosis of pronounced emphysema at the bases was rendered possible, which would have been missed on X-ray film. Tomography opens up an unexplored field regarding the bronchial tree, revealing thicknesses in the walls of the branches, or narrowing or enlargement, which would otherwise pass unobserved.

E. L. Collis

BELAYEW, D. L'utilité de la tomographie chez les pneumoconiotiques. **[Value of Tomography in Pneumoconiosis]** *Arch Malad Professionnelles* Paris. 1952, v 13, No 3, 257–62, 4 figs

An expanded account of the work reviewed in this *Bulletin, 1951, v 26, 1178

HASSELT INSTITUT D'HYGIÈNE DES MINES. Gén /165 Communication No 88 Recherches médicales Radiographie et tomographie l'artere pulmonaire dans l'anthraco-silicose [LAVENNE, F. & BELAYEW, D] **[Medical Research. Radiography and Tomography of the Pulmonary Artery in Anthraco-Silicosis]** 9 mimeographed pp [18 refs] 1951, Sept 10

Antero-posterior X-ray shadows of the pulmonary artery may be obscured by shadows thrown by silicotic fibrosis and nodules Yet this artery, in cases of "cor pulmonale" feels the strain of impeded pulmonary circulation and shows it by dilatation and an exaggerated convexity of its arc The limit between the normal and abnormal is difficult to define; the convexity of the pulmonary arc ought, to be significant, to attain a tangent common to the aortic arc and the left ventricular arc Among 200 anthraco-silicotic patients 15 were seen with an abnormal salient of the pulmonary arc; all had fibrosis or advanced emphysema In 106 anthraco-silicotics X-rays were used antero-posteriorly, obliquely to the right and to the left, and laterally. In the films oblique to the right, half showed an undue convexity of the pulmonary arc, among whom 13 had no fibrosis or emphysema, while 18 had definite fibrosis and pronounced emphysema; most of such advanced cases had a convexity with a chord of more than 50 mm. and a radius of more than 5 mm A salient was also seen bulging onto the oesophagus at the back. Advantage was gained by following through the shadows by tomography, which often cleared up doubtful observations, the shadows being watched from front to back, and from side to side Throughout these investigations consideration must be given to shadows seen in normal persons, who tend to exhibit considerable variations in the arc of the pulmonary artery The observations establish the fact that the pulmonary arteries are not dilated even in advanced cases of anthraco-silicosis, associated with right cardiac strain Indeed, the method of observation is not quite as useful as was hoped.

E. L Collis

*See above

CAZAMIAN, P. Les images pneumoconiotiques observées dans les charbonnages. Leur évolution et leur signification étiologique **[Pneumoconiotic Pictures Observed on Coal-Fields. Their Evolution and their Aetiological Significance]** *Arch Malad. Professionnelles.* Paris. 1953, v. 14, No 2, 135–9

The author endeavours to introduce, to his own satisfaction, order in the many descriptions of pneumoconiosis among coal-miners, particularly by classifying X-ray appearances The shadows are grouped as fine and extensive The fine are sub-grouped as (a) reticulation, (b) reticulation with pin-head nodules, (c) pin-head nodules, the nodules being less than 1 mm., (d) small nodules between 1 and 2 mm., and (e) nodules exceeding 2 mm. but less than 5 mm. The extensive shadows also are sub-grouped as extensive shadows based upon each of the above 5 sub-groups, with an additional sub-group based upon emphysema. Pneumoconiosis is held to pass step by step through a stage of dispersion on to condensation, fine shadows always preceding extensive ones

The stages of evolution are set forth in detail (which may or may not represent any clinical findings) with a fresh sub-grouping for each Nodular pneumoconiosis characterizes silicosis as seen among men doing rock-work underground, but is seldom seen among coal-getters, who develop a simple non-nodular pneumoconiosis with a benign prognosis. Since, however, few exposures to dust are pure, all these groups and sub-groups are liable to become mixed. [Kipling's dictum comes to mind that "there are nine and sixty ways of constructing tribal lays And-every-single-one-of-them-is-right!"]

E. L Collis

COCHRANE, A L, CHAPMAN, P J. & OLDHAM, P. D. **Observers' Errors in taking Medical Histories.** *Lancet.* 1951, May 5, 1007–9, 2 figs [13 refs]

A survey of 993 coalminers was carried out by six different observers Three observers interviewed approximately random selections of 261, 250 and 300 men The remaining 182 men were interviewed by three other observers whose results were pooled so as to make a fourth group There were usually three interviewers present in a room together, men waiting to be interviewed formed a queue, and the man at the head of the queue went to whichever interviewer happened to be free at the time The age distributions of the four groups were similar During the interview which lasted about five minutes, each man was asked whether he had cough, sputum, pain in the chest, tightness of the chest, or shortness of breath, and whether he had a history of bronchitis, pneumonia, pleurisy or dyspepsia The proportions of the four groups recorded as giving the answer "Yes" differed significantly for cough, sputum, pain in the chest, and dyspepsia These proportions ranged from 23 to 40 per cent. for cough, 13 to 42 per cent for sputum, 6 to 17 per cent for pain, and 10 to 27 per cent for dyspepsia These four questions are regarded as the most difficult ones to answer without supplementary discussion The authors consider that more effort should be made to reduce subjectivity in interviewing, in both clinical practice and research projects

P Armitage

NADIRAS, P. & DELESVAUX, R Exploration électrocardiographique d'un groupe de silicosés. **[Electrocardiographic Examination of a Group of Silicotics]** *Rev Méd Minière* Douai. 1951, v. 4, Nos 13/14, 3–9 4 figs on 2 pls

Differences may exist between the X-ray appearances in cases of silicosis and the symptoms complained of, a cardiographic examination, it is claimed, may assist in clearing up such differences A group of 110 silicotic coal miners were examined in this way They fell into 5 categories The first included 19 men in whom the silicosis was associated with some cardiovascular affection, one had angina pectoris, 12 had high blood pressure, and 6 had valvular incompetence, X-rays showed 8 instances of minute nodules, 6 of nodules, and 5 of patchy fibrosis The second category comprised 17 men with enlarged heart, in 9 the electrocardiographic tracings were normal, 7 showed hypertrophy of the left ventricle, and one chronic "cor pulmonale", X-rays showed minute nodules in 5, nodules in 7, and more advanced fibrosis in 5 The third category comprised 11 men with arrythmia, in 8 the tracings were quite normal, 2 showed "cor pulmonale", and one hypertrophied left ventricle, here X-rays indicated 2 instances of minute nodules, 2 of nodules, 6 of advanced fibrosis, and one of silico-tuberculosis. The fourth category comprised 31 men with slow recovery after effort, the tracings were normal in 10, suggestive of "cor pulmonale" in 10, and in 11 the electrocardiographic changes accorded with such cardiac conditions as hypertrophied left ventricle or angina pectoris, X-rays indicated minute nodules in 7, nodules in 7, and more advanced fibrosis in 17. The fifth category comprised 32 men with lack of agreement between performance and X-ray findings; silicosis was present in 18 with minute nodules, in 6 with nodules, in 7 with confluent fibrosis, and in one with silico-tuberculosis, the tracings were normal in 17, in 5 indicative of an overburdened right heart, and in 10 of cardiac conditions quite separate from silicosis. Three pairs of illustrations show both tracings and X-ray pictures. The electrocardiograph would appear to present valuable complementary evidence when capacity for work is under consideration in cases of silicosis, it may sometimes give early evidence of chronic "cor pulmonale", and it may disclose the presence of cardiovascular conditions distinct from silicosis, but affecting working capacity

E. L Collis

HASSELT INSTITUT D'HYGIÈNE DES MINES Gén / 168 Communication No 90 Recherches médicales Intérêt de l'examen électrocardiographique dans l'anthraco-silicose [LAVENNE, F.]. **[The Value of the Electrocardiograph for examining Anthraco-Silicotics]** 1951, Oct 30, 5 mimeographed pp

The author used the electrocardiograph to examine 11 cases of anthraco-silicosis with clinical signs of loss of compensation of the right ventricle, and 200 cases of anthraco-silicosis, compensated for invalidity but still ambulant, who were doubly classified according to the extent of fibrosis present and according to the amount of emphysema The findings are presented in somewhat cryptic symbolism They are held to justify the claim that the electrocardiograph may be of considerable value in establishing early strain on the right side of the heart

E L Collis

FLETCHER C M Le diagnostic de la pneumoconiose des mineurs **[Diagnosis of Pneumoconiosis in Miners]** *Bruxelles-Méd* 1952 Apr 13 v. 32, No 15, 755–61

A general account

SLESINGER, H A **Anthracosilicosis in Bituminous Coal Miners. Clinical and Pathological Manifestations.** *Arch Indust Hyg & Occupational Med* Chicago 1950, Sept, v 2, No 3, 284–99, 6 figs

Silicotic changes in the lungs of coal workers have long been known to occur, in spite of the fact that coal dust is generally considered to be unable to cause fibrosis

The common occurrence of silicosis among haulage

workers in coal mines resulting from the use of sand for adhesive purposes has been almost eliminated in recent years by the use of masks The other common cause of silicosis in coal miners is the drilling of siliceous rock in mine headings, but a certain amount of less severe disease occurs among other coal workers whose exposure to a silica risk is less obvious.

The investigation of a suspected case of anthraco-silicosis must include a careful occupational history as well as clinical, pathological and physiological studies, and X-ray. The common clinical findings are dyspnoea, cough, cyanosis, pain in the chest, asthenia, loss of weight, dyspepsia and, in the later stages, oedema of the legs. Physical signs in the chest are often doubtful. The X-ray appearances are classified into three stages:

(1) Increased lung markings
(2) Nodulation
(3) Consolidation

Pleural adhesions are common and spontaneous pneumothorax may occur.

Pathological changes do not include a raised sedimentation rate unless active tuberculosis or other [illegible]

pigmentation

Two illustrative cases with X-rays and electro- [illegible]

[illegible] development of disease. Treatment by antispasmodics and intermittent positive pressure breathing are sometimes of value.

[This paper does not make it clear whether the author considers "anthracosilicosis" to be essentially the same as silicosis or not There is no reference to the considerable body of evidence suggesting that coal workers' pneumoconiosis is a disease quite separate from silicosis, and on the other hand the paper contributes nothing new to the already massive literature of silicosis]

B. M Wright

MARTIN, J. E, JR **Coal Miners' Pneumoconiosis.** *Amer. J. Pub. Health.* 1954, May, v 44, No 5, 581-91, 6 figs [17 refs.]

This paper reviews recent work on coalworkers' *pneumoconiosis in* South Wales and gives some results of the investigation of 400 miners admitted to hospital in the United States *over a 5-year* period, either because of respiratory symptoms or because their chest X-rays have been found to be abnormal The radiological appearances are described and found to be identical with those described in South Wales. In 15 cases in which autopsy was performed the pathology is also essentially the same as that described in British miners Maximum breathing capacity estimations were carried out on these men and used as a measure of their disability. It was found that [illegible]

use *of bronchodilator aerosols* *The paper ends with* a plea for obtaining reliable statistics as to the incidence of this disease in the United States and for the institution of preventive measures

C. M. Fletcher

FRIEDMAN, L. L. **Significant Case of Pneumoconiosis in a Soft-Coal Worker.** *Arch. Intern. Med* 1955, Feb., v. 95, No. 2, 328-32, 9 figs

The paper presents the case history of a soft-coal worker who had worked for an unspecified time at [illegible]

fibrosis with severe emphysema at both bases Serial X-rays are given and lung sections prepared by Professor GOUGH, both confirming massive fibrosis with ischaemic cavitation. The patient was treated with [illegible] without effect [illegible] ss of pro- [illegible] pneumoco- [illegible] he absence [illegible] uberculosis therapy Its particular interest lies in the observation that the Mantoux reaction was negative

C M Fletcher

WALL, N. M. **Anthracosilicosis, with special reference to Pulmonary Cavitation.** *Amer. Rev Tuberculosis.* 1955, Apr, v. 71, No 4, 544-55 [12 refs]

The author writes with extensive experience on American anthracite coal-fields. He reviews 100 autopsied cases of anthraco-silicosis. He challenges [illegible] determines [illegible] ercu- [illegible] there [illegible] short case history is given of each of these [illegible] none of which could tubercle bacilli be found Unless specially investigated the cavitation in each might have been held to be tuberculous The three cases of tuberculosis which developed were of miliary type

occurring in cases of anthraco silicosis, two of them

sanatorium?

hospital population In fact, the clinical impression gained was that patients with advanced anthraco-silicosis usually die a cardiac death and rarely a respiratory death [If tuberculosis has so little to do with anthraco-silicosis, there can be little value in so strictly excluding the infection from anthracite mines] *E L Collis*

COCHRANE, A L **Tuberculosis and Coalworkers' Pneumoconiosis.** *Brit J Tuberculosis* 1954, Oct, v 48, No 4, 274–85, 4 figs [40 refs]

The distinction between "simple pneumoconiosis" and "progressive massive fibrosis" (PMF) in coal-workers' pneumoconiosis is generally accepted in Western Europe British workers consider the former to be due simply to the accumulation of inert coal dust in the lung, whereas continental workers stress the effect of silica The latter is regarded in Britain as the consequence of tuberculous infection modified by coal dust, but on the continent it is thought that massive fibrosis can arise from the action of silica without tuberculous infection, though the latter often plays an important part

The author begins his discussion of these inter-relationships by a historical review of the belief, dating from 1763, that coal dust in the lung exerts a beneficial effect on tuberculous infection He then defines his epidemiological terms attack, prevalence, case fatality and mortality rates In Great Britain tuberculosis mortality rates among coal miners have generally been low but this tendency is now decreasing An occupational effect has been suggested by the lower standardized rates for miners than for their wives The possibility that the low rates for miners are due to occupational selection is shown to be unlikely, since the mortality rate for all males in a complete mining district (the Rhondda Urban District) is lower than that for England and Wales as a whole, while the female rate is higher than in England and Wales The favourable rates for males in the Rhondda Valley are not shared by coal hewers and getters, who have a high tuberculous mortality, especially in the older age-groups, while other underground workers who have a smaller dust exposure have a lower rate A possible explanation is that a slight exposure to dust decreases, and a higher dust exposure increases, either the attack rate or case fatality from tuberculosis, or both

Existing evidence that the attack rate of tuberculosis and PMF increases with increasing severity of simple pneumoconiosis is presented Previous evidence that the prevalence rate of tuberculosis increases with prevalence of pneumoconiosis was liable to various sources of error. Errors have been introduced

with a positive sputum), found in the recent survey of a complete mining community in the Rhondda Fach It is shown that in the earliest stage of simple pneumoconiosis there is a decrease in prevalence of active tuberculosis, compared with normal controls without radiological evidence of pneumoconiosis, but that as simple pneumoconiosis increases in severity there is a marked increase in active and to a less extent in infectious cases, together with a slight decline in inactive cases It is thus argued that with increasing simple pneumoconiosis the attack rate of tuberculosis must be increased Since the proportion of sputum positive cases (in which there is a high case fatality) increases in the advanced stages of

advanced stages

Since the severity of simple pneumoconiosis depends simply upon the concentration of dust to which men are exposed and the duration of exposure, slight dust exposure will decrease tuberculous mortality but more severe or prolonged exposure will

last century,

(2) the relationship between prevalence of tuberculosis and the prevalence of pneumoconiosis,

(3) the favourable mortality rates of miners in mining districts with less dusty mines, and the converse,

(4) the higher mortality rates in colliers compared with other workers underground on the basis that the latter were getting a "therapeutic dose" of dust while the former had excess

It is admitted that it seems unlikely that the same factor could cause at the same time both a fall in case fatality rate and a rise in attack rate One way out of this dilemma might be to suggest that one effect is due to the physical properties of coal dust, such as its ability to absorb tuberculin and increase fibrosis, whereas the other is due to its chemical properties, such as the silica content However, a study of the industrial histories of miners in the Rhondda Fach with simple pneumoconiosis alone and

cases, markedly so in those with extreme emphysema.

[illegible]

within 3 years after the onset of tuberculosis; sanatorium care may prolong life in selected cases. Treatment is essentially symptomatic, relief may be given by the guarded use of intermittent positive pressure treatment with pure oxygen and aerosol administration of antibiotics and bronchodilator drugs.

With regard to the social spread of tuberculosis it is noted that home conditions of the miners as a whole showed overcrowding and privation; nevertheless, mass X-ray surveys of 134,775 school-children, food-handlers, industrial workers and various community groups in the anthracite regions of Pennsylvania during 1948 and 1949, revealed [illegible]

CAPLAN, A. **Certain Unusual Radiological Appearances in the Chest of Coal-Miners suffering from Rheumatoid Arthritis.** *Thorax.* 1953, Mar., v. 8, No. 1, 29–37, 4 figs. & 2 diagrams. [14 refs.] *An Appendix.*

The suggestion put forward is of considerable interest. It is that, at least among coal-miners in South Wales, rheumatoid arthritis may be associated with a distinct form of pneumoconiosis, recognizable by X-ray and often, if not always, infected by tubercle. The evidence was gathered from examination of some 14,000 films of claimants for pneumoconiosis benefit in Cardiff, of whom 51 had rheumatoid arthritis Some 90 per cent. of these 51 men had massive fibrosis, compared with an incidence of about 30 per cent. in all the men examined The characteristic X-ray appearances of "rheumatoid" opacities (present in 13 cases) were: round well-defined opacities of homogeneous density, about 1 cm. in diameter (extremes, 0 5 to 5 cm.), scattered evenly throughout the lung fields, typically peripheral at [illegible] develop [illegible] occa- [illegible] esting [illegible] apical [illegible] e seen in others; tuberculosis was confirmed in all the 5 cases which came to post-mortem examination. No relationship was found between the severity of the joint lesions and the X-ray changes The most noteworthy clinical findings were the absence of constitutional symptoms, even when tuberculosis was suspected, and the infrequency of more than slight impairment of respiratory function.

Evidence is to be presented later that, on X-ray appearances alone, cases with rheumatoid arthritis can be detected. The question is unanswered whether the lesions are allied to tuberculomata, a form of tuberculosis modified by dust, or whether the joint changes are a manifestation of tuberculous rheumatism. Further investigations are needed and are in progress. *E. L. Collis*

MIALL, W. E, in co-operation with A. CAPLAN, A L. COCHRANE, G S. KILPATRICK & P. D. OLDHAM **An Epidemiological Study of Rheumatoid Arthritis associated with Characteristic Chest X-Ray Appearances in Coal-Workers.** *Brit Med J.* 1953, Dec 5, 1231–6, 5 figs on pl [22 refs]

An epidemiological study was made of rheumatoid arthritis in coal miners in South Wales to investigate the claim that this disease is associated with nodular fibrosis of the lung, radiologically similar to, but distinguishable from, progressive massive fibrosis as seen in coal-workers' pneumoconiosis. The type of chest lesions associated with rheumatoid arthritis develops rapidly with numerous discrete opacities scattered diffusely over both lung fields They appear in crops and may then change little over years, they have been noted only in men exposed to a dust hazard. Twenty films were selected showing these radiological appearances and as controls 3 other X-ray groups. The prevalence of rheumatoid arthritis was much higher in the 20 than in the other groups, and might have been diagnosed from the films, further, the arthritis was more prevalent in miners with progressive massive fibrosis than in those with simple pneumoconiosis No certain correlation could be established with age or length of exposure to dust, except that men with exposure to silica dust showed rather more tendency to be rheumatoid The rheumatoid X-ray films with arthritis belonged to the more asthenic type of men Agglutination tests suggested that the rheumatoid lungs are a form of tuberculosis, but bacilli were found only once in sputa or laryngeal swabs In most cases the onset of arthritic symptoms seemed to coincide with the development of the lung lesions, but they may precede them or occur subsequently "Rheumatoid" lung lesions call for further and more extensive study. *E L Collis*

VAN MECHELEN, V. Les rhumatismes chroniques chez les houilleurs belges Le syndrome de Caplan **[Chronic Rheumatism among Belgian Coal-Miners. Caplan's Syndrome]** *Arch Malad Professionnelles* Paris 1954, v 15, No 6, 525–30 [12 refs]

The claim has been made that coal miners suffer in excess from rheumatism; but, after examining [illegible] Britain and

occur among miners, rheumatic conditions are not more frequent among Belgian miners than among other workers doing heavy work The localization of rheumatism in these miners does not differ from that seen in French, English or German miners. The lumbago tends to be associated with disk lesions.

A search was made for examples of Caplan's syndrome in which polyarthritis occurs in cases of pneumoconiosis The polyarthritis affects the fingers, wrists, elbows and other joints, and the lung fields show largish nodules particularly situated at the edges of the lobes Details of 4 cases are given, but none is claimed to belong to Caplan's syndrome Anthraco-silico-tuberculosis in all its modifications may surely occur in instances of polyrheumatoid [illegible]

HASSELT, INSTITUT D'HYGIÈNE DES MINES Gén / [illegible]

In this article the literature is reviewed and experience is reported of the hospital treatment of pneumoconiosis among coal miners Of the many forms of treatment referred to some appear to have been successfully applied by the authors.

Inhalation of aerosols of penicillin in associated catarrhs, especially with purulent sputum, and autogenous vaccines and other methods of controlling naso-pharyngeal infections have been used Bronchospasm may be relieved by numerous drugs, a mixture which has been used with success contained aleudrine, idrianol and novocaine, or theophylline with novocaine, inhalations were given daily for three weeks, the best results were obtained in miners who had symptoms resembling bronchial asthma

[illegible]

tant · avoidance of dusty or irritant atmospheres; [illegible]

peritoneum was successful in one case but the disease progressed six months later Streptomycin was [illegible]

regarded as encouraging in view of the usually progressive character of silico-tuberculosis.

Complicating acute pulmonary infections have been successfully treated with penicillin, cases of spontaneous pneumothorax have been treated with penicillin and sulphonamides to avoid pleural infections

It is concluded that therapeutic measures are palliative and symptomatic and the results are limited; the silicosis problem can be solved only through technical measures of prevention.

E. L. Middleton

GORDON, B & MOTLEY, H. L. **Pathological and Physiological Factors Involved in the Treatment of Silicosis in Coal Miners.** *Arch Indust. Hyg & Occupational Med* Chicago. 1950, Oct, v. 2, No 4, 365–73 [Refs. in footnotes]

Treatment in cases of pneumoconiosis is concerned [illegible]

"black" sputum often occurs for 8 to 10 days after the treatment is started, with relief of dyspnoea and of the asthma-like attacks Return to work may even be possible This improved pulmonary drainage and aeration occurs without any change in X-ray shadows This treatment has been followed with success in more than 500 cases of pneumoconiosis

among coal miners Tuberculosis is far less frequent *in these cases than in* ordinary silicosis; in such superimposed infection the use of enforced lung exercises may be contraindicated. Measurements following a course of intermittent positive-pressure breathing have consistently revealed an increase *of maximal breathing capacity, the* average being about 20 per cent, while increases of over 100 per cent have been observed. *E. L. Collis*

MIALL, W. E, OLDHAM, P. D & COCHRANE, A. L **The Treatment of Complicated Pneumoconiosis with Isoniazid.** *Brit J. Indust Med.* 1954, July, v 11, No 3, 185–91, 1 fig. [16 refs]

A feature of this report is the outstanding care which had to be exerted to obtain the material upon [illegible] Finally results [illegible] the age of 52 with early progressive massive fibrosis [illegible] One group acted as control A dose of 100 mgm of isoniazid was given twice daily for 3 months to one group; an interval of 4 months followed, and then 3 months of the same doses The other group received indistinguishable inert tablets. The two groups led similar lives during the time Reliance for evidence of progress in the fibrosis was placed upon X-ray *changes, films of which were read by independent* observers who did not know to which group any film belonged. Some slight progression was accounted for by dust exposure at work A Middlebrook-Dubos [illegible] gave no help, nor did measuring [illegible] cent with [illegible] with 30 per [illegible] this result [illegible] considered [illegible] isoniazid especially [illegible] *influence the progression of existing* lesions and the development of new ones is rather against tuberculosis being an active agent in determining fibrosis

E L Collis

GILSON, J. C & KILPATRICK, G. S. ***Management and* Treatment of Patients with Coal-Workers' Pneumoconiosis.** *Brit. Med J.* 1955, Apr. 23, 994–9 [11 refs]

Statistics of *the incidence of coal-workers'* pneumoconiosis are derived from the certificates issued for compensation; it is now apparent that the very high relative excess in the South *Wales coalfield is* becoming less marked owing to a diminution in the *number* of certifications in that area and an increase in other coalfields The interest of the subject is thus becoming broadened

Coal-workers' pneumoconiosis is regarded as of 2 distinct but related forms. simple pneumoconiosis caused by the gradual accumulation of fine dust in the lungs and increasing with continuing exposure; and massive fibrosis which advances whether or not exposure to dust *continues, and is believed to be due* to tuberculosis modified by the presence of coal-dust, tubercle bacilli may be isolated in about 40 per cent of cases at autopsy but in less than 10 per cent of patients coming to hospital. Prevention of serious disability from pneumoconiosis depends on reducing exposure to coal-dust and eliminating the risk of infection by tuberculosis in the mines and in the *general community. By* using *full* size X-ray films and good technique the early stage of simple pneumoconiosis can be detected when the risk of developing complicated pneumoconiosis is slight Diagnosis is [illegible] increasing breathlessness, cough [illegible] characteristic, but do not necessarily indicate the *severity of the disease or the amount of* disability The disease changes slowly and even quite seriously disabled men with complicated pneumoconiosis may do useful work in a job within their capacity In *discussing the disease with the miner the method of* approach is important and a full explanation may save misunderstanding and gain his confidence Under the Industrial Injuries Act any miner with diagnosable disease is eligible for some compensation, the amount depending on the assessment of his disability made by the pneumoconiosis medical panel of the Ministry of National Insurance

Well-informed advice in problems *of employment* is often of greater value to the miner than anything else doctors can do for him The miner receiving compensation for pneumoconiosis is now allowed to continue working underground and provision can be *made for him to work in places* where conditions as regards dust are "approved" The pneumoconiosis panel offers the miner advice on re-employment. In 1953 75 per cent of their letters advised *men to continue* in the industry, 12 per cent recommended work on the surface in dust-free conditions and about 6 per cent. advised leaving the industry By the end of 1953 of 8,200 miners referred for employment in *"approved" conditions only* about one-tenth rejected the advice Rapid improvements are now being made in the mines by dust prevention and the *extent of* "approved" conditions at the *coal-face is greatly* increased Patients' requirements vary in individual cases with age, the amount of disability, and financial and other commitments Men who are *on the* Disabled Register at the Labour Exchange can receive help in finding a job from the disablement resettlement officer

Treatment for the relief of symptoms is given in *some detail, the control of bronchospasm* by equable temperature, inhalation of adrenaline and atropine compound spray (BPC), which can be self-administered, may *be of material help; other bronchodilator* drugs may be beneficial. Patients who respond well to adrenaline may be taught to give the injections themselves and they gain considerable benefit, *physically*

and psychologically, from knowing that they have a powerful remedy at hand when in need. In acute pulmonary infections penicillin combined with streptomycin is usually effective; other antibiotics should be reserved for cases in which those fail For cough with much sputum postural drainage is of value, simple expectorants may relieve the morning distress. Men with complicated pneumoconiosis and tubercle bacilli in the sputum respond poorly to chemotherapy, but continuing such treatment over a long time and allowing the patient to continue at work seem the most logical courses to adopt *E L Middleton*

MEIKLEJOHN, A. **Coalminers' Pneumoconiosis. Employment Problems of the Disabled.** *Lancet*. 1951, Dec. 29, 1216–18

In a historical retrospect evidence is quoted that pneumoconiosis was unduly prevalent among coal miners, especially in Scotland, in the first half of the nineteenth century. Thereafter the incidence seems to have declined until the introduction of more machinery to cut the coal, with a great increase in the amount of dust created, this has happened particularly in the anthracite seams of South-West Wales Compensation was granted for the disease in 1943; but a miner receiving compensation became barred from all mining work Hence, thousands of miners only slightly affected gave up their work, while bitterly resenting compensation regulations which took their work away from them Later, the disablement provisions were amended to permit slightly affected men, without tuberculosis, to continue at work At the same time schemes for the rehabilitation and resettlement of the miners were planned But what is wanted is rehabilitation of

1944 to 421 in 1950 The incidence grows with the number of X-ray examinations Nevertheless, compared with men disabled by other conditions such as emphysema, rheumatism, and cardiovascular degeneration, the pneumoconiotic miner usually has the advantage of greater physical fitness The disease must continue to be proportional to the number of mines that contain dangerous concentrations of airborne dust Doctors must point out the dangers,

before too late

No cure is known for miners' pneumoconiosis or indeed for any other form of pneumoconiosis, as the damage done to the pulmonary tissues seems to be irreversible Hence the importance of the truth

E. L. Collis

HUGH-JONES, P & FLETCHER, C M **The Social Consequences of Pneumoconiosis among Coalminers in South Wales.** *Med Res Council Memorandum No 25* 54 pp, 5 figs 1951 London H M Stationery Office [1s 9d]

The Medical Research Council's Pneumoconiosis Research Unit, of which Dr C M Fletcher is Director, has included in its studies the social as well as the medical aspects of the disease, and especially the question of suitable remunerative employment for the disabled miners The social investigation reported in the Memorandum was carried out partly by the Unit and partly by H M

The subject matter is in three parts In the first part a review is made, with data on the numbers of men affected (1931–48) and classified as to certification and survival, the financial and psychological effects of the legislation for compensation between 1928 and 1948, which proceeded by stages to enlarge the basis of certification, the search for employment, under handicaps of physical disability, age and sex,

illness From the employers' point of view the evidence showed that at suitable work men with

are eligible for work in Remploy Factories or the Home Work Scheme run by the Disabled Persons' Employment Corporation where they are not competing with normal workers Eleven per cent of the male working population of South Wales are disabled so that there is great

Trade scheme for attracting private industry to

South Wales has reduced general unemployment in the area but it has not overcome the unemployment of men with pneumoconiosis.

Conclusions on this review emphasize suitable employment as the most urgent necessity. Medical measures should provide an adequate system of following up the men after diagnosis, periodical examination of certified men for giving advice and for grading according to disability and prognosis, reassurance of early cases and reference to Rehabilitation Centres for assessment, training and placing in employment; such follow-up and grading should be done at a properly equipped centre

In the second part of the Memorandum statistical information is presented, it was chiefly derived from official sources and is made as comprehensive and complete as possible to about the end of 1947. The data include the numbers of new cases of pneumoconiosis certified annually 1931–48; and the incidence in the total number of colliery workers in South Wales and in Great Britain The figures raise the questions of the rapid increase of certifications since 1942, and the much greater prevalence of the disease in South Wales. Other subjects examined include the present population of ex-miners with pneumoconiosis in South Wales; a comparison between the unemployment of the male working [illegible]

pneumoconiosis finding suitable employment.

The third part of the Memorandum gives the case histories of twelve men, as types among many, representing different stages of pneumoconiosis and illustrating the social consequences of pneumoconiosis to the patient, and his outlook and reactions.

There are three Appendices The first gives a [illegible]

Davies, I. **Rehabilitation and Resettlement in Pneumoconiosis.** *Rehabilitation* London 1951, Jan, No 1, 10–13, 23

The problem of rehabilitation and resettlement of coalminers suspended from work in the mines on account of pneumoconiosis is now well known In South Wales, where more than 17,000 men are suffering from coalminers' pneumoconiosis, over 4,000 of them are still unemployed; it is estimated that between 2,000 and 3,000 men are still leaving the industry each year from this cause Increased knowledge of the disease ensures earlier diagnosis, and improved prognosis when men are removed from the dusty environment in the early stages

The line of rehabilitation and resettlement is in three stages: (1) reassurance of the patient after careful medical assessment; (2) suitable exercises and physiotherapy to improve the dyspnoea; (3) suitable employment near the patient's home The author places great emphasis on the critical period when the man has left coal mining and has not been settled in other work, and when the psychological, social and economic background is depressing and the physical condition tends to deteriorate, this interval should be filled by properly organized medical rehabilitation. Observation of many hundreds of these men shows that fixation of the thorax has followed work under cramped conditions, remedial exercises, recommended to be carried out under the supervision of a physiotherapist, are directed to increasing the mobility of the spine and ribs, and the use of the abdominal muscles; these exercises are of great benefit. Pains in the chest wall which occur during exercise are relieved by heat treatment and massage After a course of such treatment observation and assessment can be made at an industrial rehabilitation unit, and vocational guidance and training instituted Suitable employment is conditioned by the degree of disability, which varies greatly; generally the work should be light and should not involve too long or sustained effort, or require a prolonged period of training Experience in some industries specially devised or adapted for miners with pneumoconiosis has shown that these men are good workmen, adaptable and persevering, with an absentee rate for all causes of about 5 per cent. and sometimes better.

E. L. Middleton

George, W. E **Some Aspects of Rehabilitation and Placement of the Incapacitated Worker.** *Med. J. Australia.* 1953, Mar. 28, v. 1, No. 13, 435–40

The value of rehabilitation in restoring working capacity to injured workers is accepted. But the difficulties of placing in remunerative employment those who remain partially incapacitated, after everything has been done, are great. The author is mainly concerned with the coal-mining industry of New South Wales, Australia 'The problems with which he is faced closely resemble those met with in South Wales, and the efforts made in Great Britain to solve them are discussed at length. These problems are most acute in dealing with pneumoconiosis due to coal dust Here incapacity in the early stages is slight and progresses slowly; shortness of breath on exertion is the first and often the only symptom. The tendency to claim to be incapacitated now varies with the compensation payments If they approximate

earnings, efforts at rehabilitation meet with little success The same, of course, applies to partial incapacity after injury Unless there is some inducement to make it worth while to resume work, many will prefer to stay idle

[illegible]

but it cannot work against the psychology of the compensated man while he is doing nothing It may even be said that the worker who is successfully rehabilitated after disablement does not require rehabilitation; he rehabilitates himself Men aged 50 to 60 with minor disability should be induced to continue at work so that they are better off economically, they will not deteriorate physically and psychologically as do many who stop work Here the physician faces problems on which he was given no light or leading when a student Attempts to rehabilitate a workman who, after an injury, has already had months and perhaps years of idleness, is waste of time and money *E L Collis*

Cochrane, A L, Fletcher, C. M, Gilson, J. C. & Hugh-Jones, P **The Role of Periodic Examination in the Prevention of Coalworkers' Pneumoconiosis.** *Brit. J. Indust Med* 1951, Apr, v 8, No 2, 53–61, 1 fig [33 refs]

[illegible]

dust appears to vary in its capacity to cause pneumoconiosis, but the relevant factors are not known.

[illegible]

These figures are regarded rather as a guide for engineers in dust control than as having aetiological significance

The work of the Medical Research Council's

[illegible]

radiograph Evidence is presented to show that the early radiological changes can be detected before serious disablement occurs, and that if men showing these signs are removed from further exposure to dangerous dust they will not develop the progressive massive fibrosis which is the cause of severe disablement. The simple form of pneumoconiosis has been classified in four stages or categories, stages 1 and 2 regarded as early and 3 and 4 as advanced To make a successful scheme of suspension from exposure to dust it is necessary to know at what stage of simple pneumoconiosis massive fibrosis will develop In a

[illegible]

category 2, and this has been suggested as a "critical stage" If a man is removed from further

[illegible]

whether or not exposure to dust ceases, and, once started, it is nearly always progressive, though at varying rates.

A pilot scheme would be necessary to determine the range of simple pneumoconiosis over which a significant risk of progressive massive fibrosis arises in different parts of the country. Practical details of

[illegible]

a scheme of periodic examinations would raise administrative and technical problems which could be solved only with increased knowledge and experience of, for example, the prevalence of pneumoconiosis in various coal mining areas, the interval between

[illegible]

South Wales has reduced general unemployment in the area but it has not overcome the unemployment of men with pneumoconiosis

Conclusions on this review emphasize suitable employment as the most urgent necessity Medical measures should provide an adequate system of following up the men after diagnosis; periodical examination of certified men for giving advice and for grading according to disability and prognosis; reassurance of early cases and reference to Rehabilitation Centres for assessment, training and placing in employment, such follow-up and grading should be done at a properly equipped centre

In the second part of the Memorandum statistical information is presented, it was chiefly derived from official sources and is made as comprehensive and complete as possible to about the end of 1947. The data include the numbers of new cases of pneumoconiosis certified annually 1931–48; and the incidence in the total number of colliery workers in South Wales and in Great Britain The figures raise the questions of the rapid increase of certifications since 1942, and the much greater prevalence of the disease in South Wales. Other subjects examined include the present population of ex-miners with pneumoconiosis in South Wales, a comparison between the unemployment of the male working

histories of twelve men, as types among many, representing different stages of pneumoconiosis and illustrating the social consequences of pneumoconiosis

of sampling enquiries undertaken by the Pneumoconiosis Research Unit, by H M Social Survey, and by a Working Party sponsored by the National Joint Pneumoconiosis Committee. The second and third Appendices include data on unemployment in relation to disability and factors related to it

The Memorandum contains a true if sombre statement of a great problem and points to the solution in relieving present distress by providing what the men want most: work suited to their capacities; and, in the longer term, by pressing on with the improvement of dust conditions in the mines.

E. L. Middleton

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The problem of rehabilitation and resettlement of coalminers suspended from work in the mines on account of pneumoconiosis is now well known In South Wales, where more than 17,000 men are suffering from coalminers' pneumoconiosis, over 4,000 of them are still unemployed; it is estimated that between 2,000 and 3,000 men are still leaving the industry each year from this cause. Increased knowledge of the disease ensures earlier diagnosis, and improved prognosis when men are removed from the dusty environment in the early stages

The line of rehabilitation and resettlement is in three stages. (1) reassurance of the patient after careful medical assessment; (2) suitable exercises and physiotherapy to improve the dyspnoea, (3) suitable employment near the patient's home The author places great emphasis on the critical period when the man has left coal mining and has not been settled in other work, and when the psychological, social and economic background is depressing and the physical condition tends to deteriorate, this interval should be filled by properly organized medical rehabilitation Observation of many hundreds of these men shows that fixation of the thorax has followed work under cramped conditions, remedial exercises, recommended to be carried out under the supervision of a physiotherapist, are directed to increasing the mobility of the spine and ribs, and the use of the abdominal muscles; these exercises are of great benefit. Pains in the chest wall which occur during exercise are relieved by heat treatment and massage *After a course of such treatment* observation

generally the work should be light and should involve too long or sustained effort, or require a prolonged period of training Experience in some industries specially devised or adapted for miners with pneumoconiosis has shown that these men are good workmen, adaptable and persevering, with an absentee rate for all causes of about 5 per cent and sometimes better.

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earnings, efforts at rehabilitation meet with little success The same, of course, applies to partial incapacity after injury. Unless there is some inducement to make it worth while to resume work, many will prefer to stay idle

After discussing the psychological factors in action, the author concludes that industrial disability should qualify for pension, as in the case of war service disability, and the pensioner should be left to earn anything more he is able to and feels inclined to Today efficient medical treatment has been made a fine art, but it cannot work against the psychology of the

habilitate a workman who, after an injury, has already had months and perhaps years of idleness, is waste of time and money *E L Collis*

COCHRANE, A. L., FLETCHER, C. M., GILSON, J. C.

v 8, No 2, 53–61, 1 fig [33 refs]

men were diagnosed as disabled by the disease, of these over 80 per cent were in South Wales Coal dust appears to vary in its capacity to cause pneumoconiosis, but the relevant factors are not known. At present the Ministry of Fuel and Power and the National Coal Board have accepted as provisional

particles/cc. in steam and bituminous coal pits. These figures are regarded rather as a guide for engineers in dust control than as having aetiological significance

The work of the Medical Research Council's Research Unit has shown that the disease in South Wales coal miners occurs in two forms "simple pneumoconiosis" in which coal dust retained in the lungs accumulates in small scattered foci which appear as characteristic minute opacities on the radiograph; and "progressive massive fibrosis" characterized by larger nodules of collagenous fibrosis which appear as massive shadows on the radiograph Evidence is presented to show that the early radiological changes can be detected before

ment The simple form of pneumoconiosis has been classified in four stages or categories, stages 1 and 2 regarded as early and 3 and 4 as advanced To

"critical stage". If a man is removed from further exposure to dangerous dust at an early stage of simple pneumoconiosis he is unlikely to develop progressive massive fibrosis; once a certain stage has been reached progressive massive fibrosis may develop whether or not exposure to dust ceases, and, once started, it is nearly always progressive, though at varying rates.

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not be made on a voluntary basis as in research studies, when very high percentage co-operation

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[illegible]

of twelve men, as types among many, representing different stages of pneumoconiosis and

[illegible]

trative aspects as to compensation schemes and benefits; the third Appendix includes some results of sampling enquiries undertaken by the Pneumoconiosis Research Unit, by H M Social Survey, and by a Working Party sponsored by the National Joint Pneumoconiosis Committee. The second and third Appendices include data on unemployment in relation to disability and factors related to it.

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The line of rehabilitation and resettlement is in three stages: (1) reassurance of the patient after careful medical assessment; (2) suitable exercises and physiotherapy to improve the dyspnoea, (3) suitable employment near the patient's home The author places great emphasis on the critical period when the man has left coal mining and has not been settled in other work, and when the psychological, social and economic background is depressing and the physical condition tends to deteriorate, this interval should be filled by properly organized medical rehabilitation Observation of many hundreds of these men shows that fixation of the thorax has followed work under cramped conditions; remedial exercises, recommended to be carried out under the supervision of a physiotherapist, are directed to increasing the mobility of the spine and ribs, and the use of the abdominal muscles, these exercises are of great benefit Pains in the chest wall which occur during exercise are relieved by heat treatment and

[illegible]

involve too long or sustained effort, or require a prolonged period of training Experience in some industries specially devised or adapted for miners with pneumoconiosis has shown that these men are good workmen, adaptable and persevering, with an absentee rate for all causes of about 5 per cent. and sometimes better.

E. L. Middleton

GEORGE, W. E. **Some Aspects of Rehabilitation and Placement of the Incapacitated Worker.** *Med J. Australia.* 1953, Mar 28, v. 1, No 13, 435-40

The value of rehabilitation in restoring working capacity to injured workers is accepted. But the difficulties of placing in remunerative employment those who remain partially incapacitated, after every- [illegible] The author is mainly [illegible] New [illegible] which [illegible] South [illegible] solve [illegible] are [illegible] due to most acute in dealing with [illegible] coal dust Here incapacity in the early stages is slight and progresses slowly; shortness of breath on exertion is the first and often the only symptom. The tendency to claim to be incapacitated now varies with the compensation payments If they approximate

earnings, efforts at rehabilitation meet with little success The same, of course, applies to partial incapacity after injury Unless there is some inducement to make it worth while to resume work, many will prefer to stay idle

but it cannot work against the psychology of the

logically as do many who stop work Here the physician faces problems on which he was given no light or leading when a student Attempts to rehabilitate a workman who, after an injury, has already had months and perhaps years of idleness, is waste of time and money. *E L Collis*

COCHRANE, A. L., FLETCHER, C. M , GILSON, J C

dust appears to vary in its capacity to cause pneumoconiosis, but the relevant factors are not known. At present the Ministry of Fuel and Power and the National Coal Board have accepted as provisional levels for "approved dust conditions" under which men may be expected to work with reasonable safety, 650 particles/cc (estimated by the thermal precipitator) between 1 and 5 μ in anthracite pits, and 850 particles/cc. in steam and bituminous coal pits These figures are regarded rather as a guide for engineers in dust control than as having aetiological significance

The work of the Medical Research Council's Research Unit has shown that the disease in South Wales coal miners occurs in two forms. "simple pneumoconiosis" in which coal dust retained in the lungs accumulates in small scattered foci which appear as characteristic minute opacities on the radiograph; and "progressive massive fibrosis" characterized by larger nodules of collagenous fibrosis which appear as massive shadows on the radiograph. Evidence is presented to show that the early radiological changes can be detected before

make a successful scheme of suspension from exposure to dust it is necessary to know at what stage of simple

whether or not exposure to dust ceases, and, once started, it is nearly always progressive, though at varying rates

A pilot scheme would be necessary to determine the range of simple pneumoconiosis over which a significant risk of progressive massive fibrosis arises in different parts of the country. Practical details of such a pilot scheme are discussed. These include the advice which men should be given after examination; this would depend on radiological appearances, the age of the man, rate of development of signs, disability

in various coal mining areas, the interval between examinations, the staff required, the effect on applications for disablement benefit, arrangements for men continuing at work under minimal dust exposure. Because of such uncertainties

not be made on a voluntary basis as in research studies, when very high percentage co-operation was obtained, unless possibly by the use of mobile

interval of 2½ to 3 years between examinations "The doctor's role is to ensure that miners who are in danger of disablement by pneumoconiosis are protected, if necessary by advising them to leave the industry. It would be for the engineer to ensure that the dust levels were such that very few men would have to be so advised" *E. L. Middleton*

South Wales has reduced *general* unemployment in the area but it has not overcome the unemployment of men with pneumoconiosis.

Conclusions on this *review* emphasize suitable employment as the most urgent necessity. Medical measures should provide an adequate system of following up the men after diagnosis; periodical examination of certified men for giving advice and for grading according to disability and prognosis, reassurance of early cases and reference to Rehabilitation Centres for assessment, training and placing in employment; such follow-up and grading should be done at a properly equipped centre

In the second part of the Memorandum statistical information is presented; it was chiefly derived from official sources and is made as comprehensive and complete as possible to about the end of 1947. The data include the numbers of new cases of pneumoconiosis certified annually 1931–48; and the incidence in the total number of colliery workers in South Wales and in Great Britain. The figures raise the questions of the rapid increase of certifications since 1942, and the much greater prevalence of the disease in South Wales. Other subjects examined include the present population of ex-miners with pneumoconiosis in South Wales, a comparison between the unemployment of the male working population in Wales and that among the [illegible] in the rest of Great [illegible] employment

[illegible] part of the Memorandum gives the case histories of twelve men, as types among many, representing different stages of [illegible] illustrating [illegible] and [illegible] includes some results of sampling enquiries undertaken by the Pneumoconiosis Research Unit, by H M Social Survey, and by a Working Party sponsored by the National Joint Pneumoconiosis Committee. The second and third Appendices include data on unemployment in relation to disability and factors related to it

The Memorandum contains a true if sombre statement of a great problem and points to the solution in relieving present distress by providing what the men want most work suited to their capacities; and, in the longer term, by pressing on with the improvement of dust conditions in the mines

E. L. Middleton

DAVIES, I **Rehabilitation and Resettlement in Pneumoconiosis.** *Rehabilitation* London 1951, Jan., No 1, 10–13, 23

The problem of rehabilitation and resettlement of coalminers suspended from work in the mines on account of pneumoconiosis is now well known In South Wales, where more than 17,000 men are suffering from coalminers' pneumoconiosis, over 4,000 of them are still unemployed; it is estimated that between 2,000 and 3,000 men are still leaving the industry each year from this cause Increased knowledge of the disease ensures earlier diagnosis, and improved prognosis when men are removed from the dusty environment in the early stages.

The line of rehabilitation and resettlement is in three stages: (1) reassurance of the patient after careful medical assessment; (2) suitable exercises and physiotherapy to improve the dyspnoea; (3) suitable employment near the patient's home The author places great emphasis on the critical period when the man has left coal mining and has not been settled in other work, and when the psychological, social and economic background is depressing and the physical condition tends to deteriorate; this interval should be filled by properly organized medical rehabilitation. Observation of many hundreds of these men shows that fixation of the thorax has followed work under cramped conditions; remedial exercises, recommended to be carried out under the supervision of a physiotherapist, are directed to increasing the mobility of the spine and ribs, and the use of the abdominal muscles; these exercises are of great benefit. Pains in the chest wall which occur during exercise are relieved by heat treatment and massage After a course of such treatment observation and assessment can be made at an industrial rehabilitation unit, and vocational guidance and training instituted. Suitable employment is conditioned by the degree of disability, which varies greatly; generally the work should be light and should not involve too long or sustained effort, or require a prolonged period of training. Experience in some industries specially devised or adapted for miners with pneumoconiosis has shown that these men are good workmen, adaptable and persevering, with an absentee rate for all causes of about 5 per cent, and sometimes better.

E. L. Middleton

GEORGE, W. E. **Some Aspects of Rehabilitation and Placement of the Incapacitated Worker.** *Med. J. Australia.* 1953, Mar. 28, v. 1, No. 13, 435-40.

The value of rehabilitation in restoring working capacity to injured workers is accepted. But the difficulties of placing in remunerative employment those who [illegible] thing has [illegible] concerned [illegible] South Wal[illegible] he is faced [illegible] Wales, and the efforts made in Great Britain to solve them are discussed at length These problems are most acute in dealing with pneumoconiosis due to coal dust. Here incapacity in the early stages is slight and progresses slowly; shortness of breath on exertion is the first and often the only symptom. The tendency to claim to be incapacitated now varies with the compensation payments. If they approximate

earnings, efforts at rehabilitation meet with little success The same, of course, applies to partial incapacity after injury Unless there is some inducement to make it worth while to resume work, many will prefer to stay idle

but it cannot work against the psychology of the compensated man while he is doing nothing It may even be said that the worker who is successfully rehabilitated after disablement does not require rehabilitation, he rehabilitates himself Men aged 50 to 60 with minor disability should be induced to con-

light or leading when a student Attempts to rehabilitate a workman who, after an injury, has already had months and perhaps years of idleness, is waste of time and money *E L Collis*

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serious disablement occurs, and that if men showing these signs are removed from further exposure to dangerous dust they will not develop the progressive massive fibrosis which is the cause of severe disablement. The simple form of pneumoconiosis has been classified in four stages or categories, stages 1 and 2 regarded as early and 3 and 4 as advanced To make a successful scheme of suspension from exposure to dust it is necessary to know at what stage of simple pneumoconiosis massive fibrosis will develop In a

category 2, and this has been suggested as a "critical stage". If a man is removed from further

whether or not exposure to dust ceases, and, once started, it is nearly always progressive, though at varying rates.

A pilot scheme would be necessary to determine the

administrative and technical problems which could be solved only with increased knowledge and experience of, for example, the prevalence of pneumoconiosis in various coal mining areas, the interval between

not be made on a voluntary basis as in research studies, when very high percentage co-operation

are payable. Increased payments are made, subject

to a total of £300 for the dependants.

Administration of the Scheme is carried out, under specified procedure, by an Administrative Board (Pneumoconiosis and Byssinosis Benefit Board, 30 Euston Square, London, N.W 1) appointed by the Minister, and representing employers and employed persons; and a Chairman and deputy Chairman who are barristers or advocates Claims are made in

relation to the employment the Administrative Board may refer the case to the Industrial Injuries Commissioner, who decides the question

E L Middleton

MINISTRY OF FUEL AND POWER **Pneumoconiosis in the Mining and Quarrying Industries.** Digest of *Statistics 1953* 28 *mimeographed pp.* 1954. London: H.M. Stationery Office. [2s. 6d]

The digest consists of a summary of legislation relating to pneumoconiosis and tables of statistics for ... first diagnosed in 1953 in the ... ndustries. ... National ... *of board-* ...

STAUB Düsseldorf 1950, Dec 15, No 23, 397–402 Bergpolizeiverordnungen zum Schutze der Gesundheit gegen Staubschäden [**Mining Regulations to Protect Health against Damage due to Dust**]

This is the complete text of very stringent new regulations introduced towards the end of 1950 in all mining districts in Western Germany

The regulations state generally that ... dust should not be produced if possible ... produced, adequate protective measures ... taken. These protective measures must be ... and the same applies to all ... ment. All men exposed to dust for more ... weeks must be examined initially and ... special doctors approved ... authoriti... examinations must inc... the report issued mu...

changes due to dust and the recommended date of the next examination.

Collieries must keep registers of all dusty places, dust control equipment in use, and the medical results for all people employed in dusty atmospheres All these regulations are enforceable by law.

G. Nagelschmidt

DUNNER, L. **Graphite Pneumoconiosis.** [Correspondence] *Lancet.* 1949, Dec 3, 1054–5

The author contends that serial radiographs previously published by him show the development of massive lesions from those of a miliary snowstorm

culosis found in the lungs after death.

H. E Harding

MCCORD, C. P. **Graphite, (Plumbago, Black Lead), as a Source of Dusty Lung Disease.** *Indust. Med & Surgery.* Chicago. 1949, Nov., v. 18, No 11, 483–6. [15 refs]

After reviewing the literature up to 1948, the author concludes that graphite dust may lead to a benign ... and that no resultant dis... ...r, be ... the ... *lletin*, ... and

H. E. Harding

JAFFÉ, F. A. **Graphite Pneumoconiosis.** *Amer. J. Path* 1951, Sept–Oct., v. 27, No. 5, 909–23, 9 figs on 3 pls. [10 refs.]

... a form of crystalline carbon. ... for ... sure ... ure ... age ... with ... of a ... for ... ame ... under observa... cough and dyspnoea on ex... disclosed the presence of a tumour ma... the right upper lobe. This mass, ... shape of an egg, was ... by lobectomy. The man ... well and ... llent expansion of the ... The portions ... and micro- ... *It* was ... s with

changes in blood vessels and bronchi, and large numbers of giant cells No sign of tuberculous infection was detected Both the graphite content and the silica content of apical tissue were 4 times that of tissue from the base, but no more silica was found than may be seen in any adult lung, and it appears to have been introduced in admixture with the

graphite particles were large, some being 30 μ or

Bovet, P Die Wirkung von Graphit und anderen Kohlenstoffmodifikationen im Tierversuch, zugleich ein Beitrag zur experimentellen Silikoseforschung. **[Animal Experiments on the Action of Graphite and other Modifications of Carbon—A Contribution to Experimental Silicosis]** Reprinted from *Schweiz. Ztschr f Allgemeine Path u Bakt* 1952, v 15, No 5, 548–65, 10 figs [34 refs]

The paper describes the effects of intraperitoneal injection of graphite, carborundum, diamond and

for every injection 5 to 10 mgm of dust suspended in 0 5 ml of water were used

It was found that all these materials produced nodules, which after various periods of time (observations up to one year) became collagenized The type of reaction was somewhat similar to that produced by quartz, but the following differences were noted The reaction took a longer time to develop with graphite than with quartz Graphite nodules occurred only if the accumulation of dust at one place was considerable. Small dust collections did not give rise to fibrous nodules The nodules were only rarely concentric and whorled Diamond and carborundum acted about as strongly as graphite but the coal reacted less and even after a year there was very little fibrosis. Graphite injected into the lungs of rats also produced a little collagenous fibrosis after 8 to 12 months

It is concluded that lung fibrosis similar to silicoanthracosis can be produced in man by graphite in the absence of quartz if the dust exposure is sufficiently long and intense. *G. Nagelschmidt*

Ruttner, J R, Bovet, P. & Aufdermaur, M. Graphit, Carborund, Staublunge **[Pneumoconiosis from Graphite and Carborundum]** *Deut. med Woch.* 1952, Nov. 7, v. 77, No 45, 1413–15, 4 figs [15 refs]

The paper describes a case of pneumoconiosis found in a man who had worked for over 20 years in the milling and bagging plant of a factory making synthetic graphite and carborundum X-rays taken during the last 4 years of the man's life showed first a soft widely disseminated nodulation and later confluent masses Silicosis of stage 2 or 3 had been

animals to be described elsewhere [see Bovet, above] showed that collagenous fibrosis can be caused by carborundum and graphite dusts

G Nagelschmidt

Among 48 moulders receiving compensation the average age was 62, and the average period of employment was 36 years Of 15 dressers and cleaners of castings the average age was 55 and the average duration of employment was 21 years at the time of receiving compensation.

The incidence of silicosis in the industry was not evenly distributed. In three of the areas, out of a total of 2,740 workers employed in the foundries, the annual incidence was 3 8 new cases per 1,000 workers, compared with 0·27 per 1,000 among 18,749 workers employed in the other areas, that is, an incidence 14 times as great. This high incidence is the subject of an investigation which is not yet completed. The annual percentage incidence of silicosis in three of the occupational groups was. sandblasters, 1·4, moulders, 0 07, enamellers, 0 01. The corresponding figures for moulder's labourers, grinders, and furnace builders, were not available.

An outline is given for technical measures in preventing silicosis which are on well known and generally approved lines. For sandblasting the most important are selection of suitable workers, suspension after 2 years' employment, unless conditions are free from risk; the use of steel shot instead of siliceous abrasives, separation of the process, and freeing castings of sand before blasting. For metal grinding the most important measure is substitution of abrasive wheels for sandstone, unlike the sandblaster, the grinder is a skilled workman who cannot be suspended from employment without hardship. In enamelling, preventive measures are directed to suppression of dust containing free silica in the mixing, melting, grinding and spraying processes, especially by enclosure of machines, application of exhaust draught, and providing respirators for certain handling processes In the foundry recommendations include mechanical methods for preparing moulding sand, and transport of castings, exhaust draught at pneumatic tools for cleaning castings, and at grinding Moulding powders should be free from silica; workplaces should be cleaned regularly, and the attention of all should be directed to the need for reducing the production of dust.

E L Middleton

REINL, W, GREINERT, W & RASCHER, W. Der Silikosebefall in den Giessereien im Raume Velbert, Heiligenhaus und Neviges **[Silicosis Incidence in Foundries in the Velbert, Heiligenhaus and Neviges Area]** *Staub* Dusseldorf 1954, June 15, No 36, 213–27, 1 fig [27 refs]

Earlier investigations, mainly outside Germany, are briefly reviewed The results are given of an examination by mass miniature radiography (7×7 cm films) of 4,232 iron foundry workers (both sexes) in the Velbert area, which contains a sixteenth of all such workers in Western Germany. Silicosis classification was carried out on the Reichmann scheme, silicosis coupled with active tuberculosis being placed in grade III. The predominant radiological features are discussed A mean silicosis incidence of 5 8 per cent. is deduced, which agrees roughly with that found in this industry in other countries; there are significant variations in incidence with occupation and period of dust exposure. Almost all the silicosis was found in the third of the workers with more than 15 years' dust exposure; advanced silicosis in general was found in workers over 50 years of age.

R. L Gordon

OBRIST, E. Die Giessersilikose in der Schweiz. **[Silicosis in the Swiss Foundry Industry]** *Ztschr. f Unfallmed. u. Berufskrankh.* 1949, Sept 15, v 42, No 3, 196–222. [24 refs]

The opinion had been expressed in Switzerland that in the foundry industry silicosis occurred only among

and this group includes 16 deaths due to silicosis

Over half of the affected men were moulders and casters, but silicosis occurred also among coremakers, labourers, burners, furnace repairers and mill operators. The distribution over the stages of silicosis, and the average number of years required to reach these stages, were.

Stage	Percentage all cases	Years required
O–I	6	18
I	21	28
I–II	13	27
II	40	29
II–III	10	36
III	10	33

Active tuberculosis was found in 23 per cent of all cases and in seven of the 16 deaths The incidence of this complicating tuberculosis is lower than in other silicosis-producing industries in Switzerland but, according to published data by BRUCE [this *Bulletin*, 1943, v 18, 486] and others, higher than in the *foundry industries of other countries*, such as Sweden and the U.S.A.

silicosis

A survey in two factories by mass radiography, followed by full-size X-rays, revealed 19 cases of silicosis produced after an average of 32 working years among 145 foundry workers exclusive of *fettlers* and sandblasters

* v. II, 82

The X-ray appearance is said to be typical, and

disease due to mixed dusts, comparatively benign and slowly progressing Complication by tuberculosis is the greatest danger, to be guarded against by periodical examination of the workers

G. Nagelschmidt

BERTSCHI, E & STIEFEL, E. Silikose in einer Grossgiesserei. **[Silicosis in a Large Foundry]** *Schweiz med Woch* 1950, Oct 28, v 80, No 43, 1163–6, 1 chart.

Moulders, core-makers, and sand-makers showed

years' exposure. Among core-makers and sand-

did not reveal any case of active tuberculosis The conditions in the foundry did not appear to favour the development of tuberculosis as do those in mining or

of general supervision of dust suppression is emphasized

E. L. Middleton

RUTTNER, J R **Foundry Workers' Pneumoconiosis in Switzerland (Anthracosilicosis).** *Arch Indust Hyg & Occupational Med.* Chicago 1954, Apr, v 9, No 4, 297–305, 5 figs [20 refs]

Foundry workers are exposed to dust arising from moulding sand, which may contain from 60 to 90 per cent quartz mixed with coal, soot and iron The

foundry workers who developed pneumoconiosis. Nine cases were complicated by tuberculosis Age at death varied from 46 to 77 The average exposure to dust was 32 6 years, and the severity of the disease was found to be proportional to the length of exposure The pneumoconiosis showed degrees from slight, through moderate to severe, which was rare The anthracosilicotic nodule was the basic lesion microscopically, these nodules were found in perivascular, peribronchial and subpleural regions The nodules were astral in shape, associated with shrinkage of the lung, causing perifocal emphysema. A striking feature is that foundry workers develop calcified anthracosilicotic tissue The condition resembles that seen in coal-trimmers Micro-incineration showed the presence of quartz particles distinctly by optical methods, but not in high amounts. Pneumoconiosis in foundry workers is a modified silicosis in which quartz, in weak concentration, plays an essential rôle

E L Collis

NORO, L & PATIÄLÄ, J. Über Vorkommen von Silikose und Tuberkulose bei Giessereiarbeitern in Finnland **[The Occurrence of Silicosis and Tuberculosis in Foundry Workers in Finland]** *Arch f. Gewerbepath u Gewerbehyg* 1954, v. 13, No. 3, 276-84, 1 fig

The investigation recorded was made as a series of routine examinations undertaken at the Institute of Industrial Hygiene for the foundry employers' organization in Finland during 1953 It included radiological examinations of 1,660 workers in 13 iron, steel and metal foundries Most of the radiographs were made on a portable apparatus with 70 × 70 mm. films at the Institute and a few with 35 × 35 cm. [*sic*, ? mm] films; large films were used where necessary for confirmation; all were examined by two radiologists independently

The results were classified on the Sydney scheme. Silicosis and fibrosis were found in 108 persons (6 5 per cent) Compared with similar investigations made in other countries the frequency of pneumoconiosis in the foundries of Finland did not appear to be high For the most part the degree of fibrosis and silicosis was slight grade O-I, 78, I, 22; II-III, 4; *silico-tuberculosis*, 4. *In the various occupations* the highest number of workers with pneumoconiosis was among moulders, with 40 cases, the next in number [not stated] were the cleaners of castings (Putzer) Comparison between the other occupational groups was unreliable owing to small numbers In workers exposed for less than 10 years fibrosis and silicosis were found in only 13 workers and of these 10 were in the first stage The largest number of cases (73) was in the exposure group of over 20 years, but, on the other hand, there were 192 workers employed for over 20 years in the foundries who showed no signs which could be diagnosed as pneumoconiosis The frequency of tuberculosis was no higher than in certain other industrial groups which were examined Only 4 cases of silico-tuberculosis were found, this pathological combination appears to be rare in Finland

[Some indication of the comparative incidence of pneumoconiosis in the 3 types of foundries—iron, steel and other metals—would have been useful]

E. L. Middleton

METHUNA, N C **Incidence of Silicosis in the Mysore Iron and Steel Works.** *Proc Soc for Study Indust Med* Jamshedpur, India 1953, Sept, v 5, No 3, 131-4.

GORDON, D. **Pneumonokoniosis in Queensland Foundries.** *Med J. Australia.* 1950, Aug 5, v. 2, No. 6, 217-24, 3 figs [38 refs]

A survey was made of Queensland foundries, 76 in all *The object* was to ascertain how far a dust hazard existed in the industry A few large foundries employed most of the workers, numbering 1,118 One foundry only dealt with steel, 22 with iron, 19 with non-ferrous metals, and 34 *with a mixture* The various processes were carefully inspected and samples of air-borne dust analysed. The dust risk for moulders was so slight as to separate them from dressers and other foundry workers *Medical examinations* with X-rays were applied to 203 moulders, 67 dressers, 42 moulders' assistants, and 47 other foundry workers. Thirteen positive cases of silicosis were found, but no instance of active tuberculosis came to light, although several cases of old healed inactive tuberculosis were seen One source of risk has been the use of silica flour and silica sprays in moulding parting powders; for this there is no need, and non-siliceous material, such as " Zircolox ", is being substituted Hazardous dust counts were found [illegible]

foundry dressers or furnacemen at the larger foundries [illegible]

[illegible] able to work and the pulmonary condition [illegible]

[The findings are in close agreement with the recently published large-scale investigation carried out by the Ministry of Labour into " Industrial Lung Diseases of Iron and Steel Foundry Workers ".]

E. L. Collis

PUBLIC HEALTH SERVICE PUBLICATION No 31 Wash **Health of Ferrous Foundrymen in Illinois.** 1950, pp vii + 130, 24 figs [172 refs]

An iron foundry has not the appearance of a health resort, there no flowers grow The outstanding characteristics are great covered-in spaces wherein [illegible] made of sand [illegible]

and an effort to portray them is given by a series of *illustrations which will only have meaning* to those familiar with this industry with its strenuous work amid a gloomy environment

A survey was made of 18 foundries in Illinois employing some 2,000 men, who are *held to present* an adequate cross-section of the industry. Some 1,100 samples of air-borne dust were collected and studied, more than 90 per cent of the *particles were 3 microns or less in size*, the free silica content varied from 13 per cent at making cores for the moulds to 29 per cent, in metal pouring, shaking out the castings and sand conditioning Settled dust contained about 30 per cent free silica Air-borne dust contained 3 to 9 per cent of iron, but at casting-cleaning the percentage rose from 30 to 38 Concentrations of carbon monoxide were found to be

high for short periods at pouring operations Measures for suppressing dust and ensuring good ventilation were the rule But good artificial illumination and reduction of noise were not to the fore The majority of the foundries were not completely mechanized

Considerable detail is devoted to the findings of medical examinations of 1,937 men, 69 per cent of whom were white persons Attention was paid [illegible]

ground-glass appearance, and a few showed nodular shadows Vital capacity estimations showed a correlation with age, but none with degree of pulmonary fibrosis On the other hand, elevated levels of blood pressure were related to increasing degrees of pulmonary fibrosis Blood studies revealed nothing abnormal, except that increasing degrees of pulmonary fibrosis were associated with increasing speed of erythrocyte sedimentation and with progressively increasing total leucocyte counts Cases of pulmonary tuberculosis, of the reinfection type, both active and inactive, were seen, but they were not more [illegible]

the standards of shadows by which the presence of varying degrees of fibrosis were determined Comparison of X-ray findings among Utah coal miners and Utah metal miners is against the metal miners rather than the foundrymen The question is put as to whether the presence of iron dust in the lungs modifies the development of fibrosis [it certainly modifies the shadows, as iron dust is impervious to X-rays, but this is not mentioned] No information is given as to whether the foundrymen with pulmonary fibrosis experience more incapacity than usual, as measured by lost time, while the absence of any undue incidence of tuberculosis which is the rule for silicotic pulmonary fibrosis is notable Definite indications were found that, without causing dental decay, the abrasive dusts after years of exposure led to wearing away of tooth surfaces, without exposing the pulp This careful survey does not bring to light any characteristic occupational disease among foundrymen

E L Collis

HEIMANN, H **The Health of Ferrous Foundry Workers.** *Pub Health Rep* Wash. 1951, Feb. 23, v. 66, No. 8 223–39, 1 fig [66 refs]

This is a condensed form of a report issued as Public Health Service Publication No. 31, "The Health of Ferrous Foundry Workers in Illinois", Feb, 1951.

HAMLIN, L E. **Anthracosilicosis occurring in a Foundry Employee.** *Arch Indust Hyg & Occupational Med* Chicago 1953, Apr, v. 7, No 4, 339–51. 6 figs. [Refs in footnotes.]

The case of pneumoconiosis reported takes interest because it was due to a mixed dust, and was complicated by a cardiac condition; the patient was under observation for years and at autopsy his organs were carefully examined The condition is called anthracosilicosis and occurred in a man employed in a foundry. Here the dust originates largely from "sea-coal" used as a parting material for castings The term "sea-coal" is said to have originated in Cornwall where the sea waves washed fine coal from an outcrop and mixed it with the sand on the shore; the mixture was used in foundries, and with it the castings were found to "peel" better Hence the custom arose of adding fine coal to the casting sand and calling the mixture sea-coal One sample contained 1 7 per cent of free silica; 80 per cent of the particles were less than 5 μ Such a content of free silica is low for a harmful dust; nevertheless the pneumoconiosis in this case closely resembled that occurring among coal-miners in South Wales

The man was first examined as a matter of routine in 1933, when he was considered normal; an X-ray was taken An X-ray in November 1948 showed definite nodular shadows suggestive of early silicosis; but there were no symptoms, and he was allowed to continue his work In July 1949 no further progression of the nodulation was found He then "felt better than he ever did". In December 1949 no new developments had taken place, and, as the foundry had closed down, he had not been exposed to dust for some time Only a month later serious cardiac symptoms developed with definite congestive heart failure, and the man died in May 1950

A careful autopsy was made which yielded the following diagnosis (a) pneumoconiosis; (b) pul- [illegible]

the atmospheric concentration of the dust was made It gave a low value for free silica and an average gross dust count of 21,400,000 particles per cu ft. which is not excessive for a mixed dust; it gave a calculated free silica content of 3,200,000 particles per cu ft which is below the maximum allowable concentration The cardiac condition receives discussion; it [illegible]

to foundry dust may give rise to pneumoconiosis

E L Collis

SANDER, O. A **Foundry Workers' Pneumoconiosis.** *Arch. Indust. Hyg & Occupational Med.* Chicago 1954, Dec, v. 10, No 6, Sect 1, 512–21, 12 figs

Results of an X-ray survey made in 1934 of men

* See above

* employed in an iron foundry [this *Bulletin*, 1938, v. 13, 856] are compared with recent X-ray findings of a number of the same men. During 20 years many improvements have taken place with regard to exposure to dust inhalation. First among silicosis producing processes was sand-blasting. Today sand has been replaced by steel shot as an abrasive for castings. Where sand is used air-helmets are worn. Moulding exposed men to silica dust when sand was used in parting compounds. Today non-silica parting compounds are used. Occasionally coal dust is em-

on the scale. Further, castings are being cleaned in "wheel abraters" before chipping and grinding.

There remains grinding, formerly done on sandstone wheels with the production of much dangerous dust; today grinding wheels are made of corundum and aluminium oxide, which emit inert dust.

The article is illustrated with numerous X-ray pictures showing how men found with pneumoconiosis at the earlier survey have hardly progressed under modern conditions of dust control. *E. L. Collis*

DOIG, A. T. **Iron in the Lungs.** *Arch. Belges Méd Sociale, Hyg., Méd. du Travail et Méd. Légale.* 1950, July, v. 8, No. 7, 442–50, 7 figs on 4 pls. [33 refs.]

Siderosis is a name given to changes in the lungs ... but the present view is that ... oes not cause ... is to X-rays; ... the blood as ... ise to cause haemosiderin ... shadows; haemosiderinosis occurs in chronic mitral disease with pulmonary congestion; the foci consist of groups of adjacent alveoli packed with phagocytes loaded with haemosiderin; the condition is due to haemorrhages occurring into the respiratory bronchioles. But iron also reaches the lungs when inhaled as dust, with or without mixture with other dusts; if it is mixed with silica dust, fibrosis forms which helps to retain more of the iron dust in the lungs. The result is encountered among iron-ore miners; their lungs may be bright brick-red in colour. Boiler-scalers tend to inhale iron and silica dust in varying proportions, and their lungs exhibit reticulation or reticulo-nodulation with extreme dyspnoea; the condition is just silicosis. Prolonged and intense exposure to unmixed iron dust may be associated with X-ray shadows without any ill health, fibrosis or disability; examples are metallic arc welders, oxy-acetylene and carbon welders. Metal polishers may also exhibit this "siderosis" which may also be seen from grinding emery, bauxite and red oxide. The resulting condition is innocuous and not associated with any fibrosis. Animal experiments have con-

"fibrotic" shadows to X-ray. Let the radiologist beware how he draws deductions from X-ray appearances. Iron is an inert dust.

E. L. Collis

VIGL...

English summary (8 lines)

Vigliani describes 3 cases which had been referre[d] to him because of X-ray shadows in the lungs. I[n] one patient, aged 27, the condition was discovered i[n] the course of mass examination by miniature radi[o]graphy of all the personnel of the factory in whic[h] this man was employed. The tasks on which som[e] of the workers, but not this patient, were employe[d] were of a dusty nature. The case turned out to b[e] a "classical" instance of mitral stenosis complicate[d] with the deposition of blood iron in the lungs.

The second patient was seen much earlier, in 194[.] when less was known about this pathological cond[i]tion and when the patient must have been aged 4[.] [not 27 as printed in the article]. There had bee[n] some suggestion of exposure to silica or to iron dust[;] the subject was a foundry worker. There was [a] history of haemoptysis, but the tuberculin reactio[n,] the erythrocyte sedimentation rate and other finding[s] excluded tuberculosis. The sputum showed "cardiac" cells but no bacilli and the diagnosis of mitral stenosi[s] was made on clinical examination and a history o[f] some years.

The other case was in a patient, aged 50, who ha[d] worked in the pottery industry for 19 years. He wa[s] found to have an insufficiency as well as a stenosi[s] of the mitral valve. This man had been receivin[g] compensation during the previous 10 years fo[r] supposed silicosis. MEIKLEJOHN [this *Bulletin*, 195[.], v. 25, 41] is quoted as having described a case o[f] ...

is favoured by Vigliani ... method of biopsy. *J. Caucht*

KEATINGE, G. F. & HARDING, H. E. **A Follow-Up Study of Pneumoconiosis in an Iron Foundry and some Investigations into the Effect of Foundry Dust in the Lungs.** *Brit. J. Indust. Med.* 1954, Oct., v. 11, No. 4, 289–95, 9 figs. [10 refs.]

A survey was made at a foundry in 1945 which

* v. I, 103

* v. II, 49.

indicated a potential risk of pneumoconiosis for foundry workers, especially for fettlers [this *Bulletin*, 1946, v. 21, 108] The present study is a follow-up of the 53 men who were examined in 1945 In the interim they had experienced few serious chest affections Only 3 men, all over 60, presented abnormal clinical signs of respiratory troubles In all but 3 cases the X-ray findings had in no way advanced

stage

died

pneur

lections of black pigment were present which proved to be oxide of iron, as oxide of iron is opaque to X-ray it would account for the shadows seen in some of the films

Animal experiments with rats were conducted with the foundry dust, they confirmed the observations made on the workers that the dust was only mildly conducive to pulmonary fibrosis The microscopic findings are well illustrated Much danger of silicotic fibrosis is eliminated now that silica-sand is no longer used in parting powders Attention is also being directed upon the problem of suppressing and controlling all foundry dusts *E. L Collis*

SCOTT, H. J , JR. & MERRITT, L M **Dust Concentrations in a Foundry—a Study in Temporal Variations.** *Amer Indust. Hyg Ass Quarterly* 1954, Sept , v 15, No 3, 193-4

Dust samples were taken by means of midget impingers once each week for 6 successive weeks in 9 locations in a foundry engaged in repetitive work. The range of dust concentrations occurring at any particular location over the period of observation emphasizes the necessity for repeated sampling in the assessment of a dust exposure. *D E Hickish*

STATUTORY INSTRUMENTS 1950 No. 1700 **Factories. The Foundries (Parting Materials) Special Regulations, 1950.** 2 pp. 1950 London H M Stationery Office. [1d]

It has been shown that one of the main sources of the silicosis hazard in foundries is the use of substances containing a high proportion of silica for facilitating the separation of the pattern from a mould, or the separation of parts of the mould Substances used for this purpose are referred to as "parting materials ".

The Minister of Labour and National Service has made these Regulations to prohibit the use as a parting material of

It is also provided that dust or other matter deposited from a fettling or blasting

Thomas Bedford

MINISTRY OF LABOUR AND NATIONAL SERVICE. FACTORY DEPARTMENT. JOINT STANDING COMMITTEE ON CONDITIONS IN IRON FOUNDRIES [HEPBURN, H A , Chairman]. **Technical Report on Practical Methods of Reducing the Amount of Fumes from Oil Bonded Cores.** 10 pp 1950. London: H M. Stationery Office. [4d.]

The amount of fume evolved from

general considerations recommendations

MINISTRY OF LABOUR AND NATIONAL SERVICE FACTORY DEPARTMENT **Dust in Steel Foundries. Second Report of a Committee appointed**

Office

The Committee was appointed in 1943 by the then Chief Inspector of Factories, and in the following year its first report was issued In it the various dust-producing processes of the industry were reviewed, and certain specific and conditional recommendations were made for reducing risks to health. Two recommendations relating to precautions at blasting operations and to the prohibition of the use

Section 47 of the Factories Act.

In order that the value of any dust-prevention or

dust-control measures may be assessed accurately within a reasonable time, a method of dust estimation which will enable large numbers of samples to be taken and estimated quickly is needed Such a method should give reasonably accurate measures of the dust concentrations There is need for an empirical standard of engineering practicability based on the lowest dust concentrations found in practice. In addition, an absolute standard specifying the maximum concentrations of the various air-borne particles that can be regarded as permissible is desirable

Reference is made to the development by W B LAWRIE of a rapid method of making dust estimations It was apparent that the speed of dust determination by any of the three instruments in common use in Great Britain—the thermal precipitator, the konimeter, and the Owens jet dust counter—was limited by the speed of counting the samples In normal work a single operator can only count 5 slides a day. Greater speed was obtained by using a photomicrographic scale, from which the concentration of dust shown by any single slide could be estimated. Each slide is viewed under a microscope in standard conditions, and the counting speed has

[illegible]

adopted this method of dust estimation as a standard technique

The regular use of this method over a lengthy period has provided material from which further estimates of its accuracy can be made, and it has been found that the accuracy obtained is adequate to the work for which it is being used

The acceleration of dust counting made it desirable to reduce the time taken to determine the free silica content of the air-borne dust clouds The British [illegible]

[illegible]

Although 33 foundry surveys have been made it is judged to be too early yet to suggest an empirical standard of dust control, based on the lowest concentrations found in practice, but some factors are appearing from the work which might well form the basis of such a standard

Neither determinations of dust concentrations nor medical examinations provide results which can be called absolute, so that the construction of an absolute standard of maximum permissible concentrations of dust is not now possible Nevertheless, the collation of dust estimations with the results of medical examinations will provide valuable information for future estimates of good conditions

[illegible]

[illegible]

fitted with the traditional type of local exhaust ventilation First results suggest that this method of dust extraction is by no means as efficient as might be imagined.

The Committee is concerned with preventing the production of dust, preventing the inhalation of dust, and reducing the use of materials containing free *silica*

The pneumatic chisel is said to produce the most [illegible]

[illegible]

is burnt on castings is the major problem in the prevention of pneumoconiosis Techniques should be reviewed with the object of preventing the use of pneumatic chisels under conditions where they can cause dangerous dust clouds The most important preventive measure is the avoidance of adhering sand on castings Much progress has been made in this direction by various changes, but much remains to be done.

Much stress is laid on the need for good housekeeping methods Further, segregation of dust-producing operations will reduce dust clouds

For the elimination of dust more work by research teams is necessary, but much other investigation can only be done by practical foundry men Some suggestions are made in the report

Investigations have been begun of the use of silica flour and substitute materials in core sands, and [illegible]

[illegible]

Danger from the removal of burnt-on material can be much reduced by the use of an oxy-acetylene flame when a suitable flux is injected with the flame The resultant slag can be removed easily and quickly with but little dust formation

[illegible]

chisel and the abrasive wheel Some work has begun on the use of local exhaust with light castings, and it is mentioned that at present there seems to be no entirely satisfactory way of applying local exhaust to very heavy castings at present Reference is made to the development of fettling benches fitted with local exhaust ventilation, and of a swing frame grinder with an attached local exhaust system. A new type of dust respirator has been developed, and some work has been done on another type which provides the wearer with a fresh-air " curtain ".

The British Iron and Steel Research Association is sponsoring experimental work on the toxicity to

white mice of various mineral and foundry dusts, on the retention of silica by animal systems, and on the [illegible]

made earlier, and reproduces the photomicrographs which constitute the scale

A description of a dust survey in a foundry, in which a konimeter and an Owens jet dust counter [illegible]

Appendix 5, also by Bloor and Lawrie, gives a summary of dust estimations made in 33 foundries Samples were taken with the Owens jet counter and also by means of salicylic-acid filters Two dozen statistical tables are devoted to the analysis of dust concentrations in different processes and under various conditions, and a further table shows the free silica content of the air-borne dust in each foundry

[illegible]

the foundries, showing the amount of dust deposited during the month of the survey at each of certain of the foundries Scatter diagrams of dust concentrations seem to show that the concentration decreases with increasing floor area per man and with increased average weight of castings produced

A description of the Linde burner by G T HAMPTON constitutes Appendix 8 The tool removes "burnt-on" and penetrated sand with ease

Dust estimations at two steel foundry fettling benches provided with local exhaust ventilation are described by W. A. Bloor and W B Lawrie in Appendix 9 A bench was fitted with a fan that extracted about 600 cu ft per min, and was designed so that air could be blown across the bench top below the level of the operator's face and in the direction of the exhaust hood When the air to provide this "curtain" was supplied by the compressed air line, and the exhausted air was discharged outside, dust counts of the order of 200 to 300 particles per cc were obtained, whereas when there was no exhaust counts of up to 1,900 or 2,000 particles per cc were observed at breathing point and in the general atmosphere

Appendix 11, also by W A Bloor and W B Lawrie, is a report of a test on a steel dressing shop mask fitted with an "air-curtain"

Thomas Bedford

AMALGAMATED UNION OF FOUNDRY WORKERS **Recommendations and Statutory Requirements for Health, Safety and Welfare in Foundries** With Explanatory Notes 110 pp, 13 figs & 2 diagrams 1954, May Manchester 16 164, Chorlton Road, Brooks's Bar [2s 6d]

In 1947 the Joint Advisory Committee on Iron Foundries, set up by H M Chief Inspector of Factories, published its recommendations for the improvement of working conditions in and the provision of safety standards for every occupation in iron foundries They are particularly worthy of study now since the accident rate in foundries is rising at a time when the rate for industry generally is falling

The 65 recommendations are reproduced in this [illegible]

[illegible]

It is intended primarily for the guidance of members of the Amalgamated Union of Foundry Workers but, concise and well set out as it is, it has in handy form much material of interest to industrial doctors *John Rathborn*

LAWRIE, W B **Dust Suppression in Foundries.** *Heating & Ventilating Engineer* 1954, July, v 28, No 325, 9-19, 11 figs [23 refs]

The best way of dealing with objectionable dust is to stop making it Thus in iron foundries certain fettling operations can be done wet, and a very small amount of water will ensure that moulding sand is dust-free Research is needed to determine why sand adheres to castings, and, if possible, to prevent it. Further, harmful silica flour as a parting powder should be prohibited and also the use of sand in shot blasting Some dust clouds will escape, containing particles below 5 microns in size which are particularly dangerous to breathe Their presence may be [illegible]

are used to control dust clouds; they should form complementary parts of one ventilating system. Much has yet to be worked out to determine the best construction of foundries, hot dusty air will rise to be rapidly cooled against roofs and fall back into the working area, the effects of currents and cross currents have not been determined Quickly revolving grinding wheels set up dust bearing currents which may quite overcome the force of locally applied

exhaust draughts. A pneumatic chisel has been devised with local exhaust ventilation through a central duct. Other applications of dust control are explained and illustrated The best form of filter for eliminating captured dust calls for research. This article rather points to the need for much more investigation than attempts to solve the difficult problem of suppressing dust in foundries.

E. L. Collis

LAWRIE, W. B. **Dust Suppression in Foundries.** *J Inst. Heating & Ventilating Engineers* 1954, Oct., v 22, 249-65, figs. 1-11. Discussion 265-8, figs. 12-13. [23 refs]

This semi-official article, emanating from the Factory Department, points out that there are two major problems in attacking dust suppression in foundries. There is the immediate danger to health from particles of silica sufficiently small to be respirable, 5 microns or less in size, and the more difficult problem of the clouds of dust which arise from time to time from founding processes and always leave the general air of foundries murky and smoky No attempt is made to tackle this second problem; but recommendations are made regarding the first

The best way to eliminate objectionable dust is to stop making it, if silica cannot be replaced in moulding sand by a less harmful material, a small amount of water thoroughly milled into moulding sand will ensure it being dust-free Certain fettling operations also can be done wet, silica flour may be prohibited as a parting powder and also the use of sand in shot blasting to clean castings. Even so, pneumatic chisels create fine dust; local ventilation may be applied through a central duct which catches the dust at its point of origin and prevents its escape Similarly, the dust flow from portable grinders may be controlled locally by a new device

Fine dust cannot easily be detected but it can be made visible by a powerful (Tyndal) beam of light which passes unseen through a dustless atmosphere, but is scattered by a suspension of dust particles—like the path of a sunbeam in a dusty room This principle may be used in dust estimation. By it dust flow patterns can be observed, instead of noting the rapidity of locally applied exhaust draughts

General ventilation presents difficulties in foundries Warm air carrying dust particles rises to the roof where it rapidly cools, to fall, dust-laden, down again upon the workers So far engineers have paid little attention to the distribution of processes on foundry floors in relation to dust elimination and control. The author calls for such attention. Grinding wheels on which dust is created present a difficult problem, as the revolving wheels carry the particles with them in a stream of air which is just thrown up into the workman's face as the wheel revolves. This stream of air travels far faster than any locally applied exhaust draught A keen discussion followed this paper during which a successful use of down-draught dust control at knock-outs was shown and illustrated The whole problem is one for engineers to tackle The hygienist must await their ingenuity.

E. L Collis

AMERICAN FOUNDRYMEN'S SOCIETY. Chicago **Health Protection in Foundry Practice.** Papers presented at a Conference on Health Protection in Foundry Practice at the University of Michigan School of Public Health, April 11 and 12, 1 in Ann Arbor, Mich in collaboration with t Michigan Department of Health, Detroit C Department of Health, The Institute of I dustrial Health, The Department of Productio Engineering and the American Foundrymen's Society 170 pp, numerous figs [14 refs.] 1952 [36s]

The material in the published papers was present to the conference with the problems of small foundri in mind, the larger undertakings usually have the own sources of guidance. The papers were supplemented by demonstrations in the University's teaching foundry

* * *

O A SANDER presented a paper on *The Nature of Disease Caused by Dust* He referred to the definition of silicosis as "fibrosis of the lungs resulting from the inhalation of dust containing free silica". He regarded the term pneumoconiosis as a source of trouble which should have no place in occupational disease laws, its basic meaning should be kept and only specific terms used for those dusty lungs which may cause disability. The foundryman's lung showed a modified silicosis due to dust which seldom contained more than 20 per cent iron and 10-20 per cent free silica, with 60-70 per cent carbon; there was less susceptibility to tuberculosis than in classical silicosis and the modifying dusts already present precluded the need for adding another The aim is to reduce the silica percentage and the total dust disseminated. Measurable impairment of lung functio occurs only when fibrotic nodules become confluent and massive fibrosis and emphysema result The iron dust in foundrymen's lungs contributes to the X-ray pattern and should be considered in evaluating the diagnosis of silicosis; the term siderosis is applicable without any implication of fibrosis These men should be assured of their fitness for work, and employers should be encouraged to employ such workers, when they have assured themselves that their foundries have been made free from the risk of silicosis Silicosis is found in older workers who were exposed to risk many years ago, and some younger workers who have been engaged in specially hazardous jobs which need special attention Cleaning castings with pneumatic hammers has been the chief cause, but larger and more forcible hydroblast has largely solved the problem.

D E VAN FAROWE presented a paper on *Management of Dust in Foundries.* Measurement of dust

requires 2 steps sampling and analysis Sampling

on a glass plate immersed in a suitable liquid, a sample of the liquid containing the suspended dust is examined in a counting cell under a microscope, and the number is counted in 1 cmm of the liquid In the electrostatic precipitator the air passes into a tube between 2 high-potential electrodes and the particles are collected on the wall of the tube, efficiency is high for metal-fume and certain other selected materials In the thermal precipitator, in which an induced current of air passes a hot wire, the suspended dust is deposited on glass slides or cover-slips held against a cold surface, it has a high efficiency for particles in the 0 2–20 μ size range and is used chiefly for enumeration and measurement of particles The konimeter takes a small sample of 5 cc of air, the suspended dust being thrown against a disk smeared with petroleum jelly, it is used for dust counts and particle measurement, the efficiency is low and selective of particle sizes, but it is rapid and convenient for comparative sampling Filtration is used for collecting samples of airborne dust on insoluble surfaces, as filter-paper, cotton, etc, or on soluble media, as sugar, resorcinol, anthracene, etc, the results are reported as weight per volume of air *The instrument to be used should be selected to suit* the conditions and the results required Methods are discussed for measurement of dust concentration in different types of localities, as in a duct system, still air, settled dust or parent material Analysis of dust for free silica may be done by chemical tests, X-ray diffraction, X-ray spectrometry or petrographically. The instrument used at the Michigan Department of Health *is the X-ray spectrometer which* comprises the goniometer, the recorder and the X-ray source The apparatus and procedure are described and illustrated Maximum allowable concentrations (MAC) of dust, based on experience in dusty industries, have been established For dusts containing 50 per cent of free silica the MAC is 5 million particles per cubic foot of air, with 5–50 per cent silica it is 20 million *particles and under 5 per cent* silica it is 50 million particles per cubic foot Illustrations depict the apparatus, procedure, and methods of recording results

In the section dealing with *Control of Dust*, H J WEBER presented a paper on *Housekeeping* This subject has received special attention during the Conference as one of first importance in securing the greatest reduction in the incidence of occupational disease and of accidents in the foundry The repercussions of bad housekeeping on the workers and the general community in relation to foundries are discussed and lessons for improvement are well expounded, these include the effect on accident rates and insurance premiums, the incidence of silicosis in ferrous foundries and of lead poisoning in brass foundries, methods of dust control and, especially, the maintenance of exhaust equipment. Once a ventilating system is in perfect operating condition a maintenance man can easily check the performance with a simple U-tube water-gauge It is usually a

E G MEITER contributed a paper on *Control of Dust Isolation, Substitution and Wetting Agents* Dust control by isolation is based on the principle of exposing only those employees necessarily engaged on the dust-producing operations Isolation may be in space, by separation of processes, *e g*, core making from the more dusty processes, or it may be in time, *e g*, by delaying dust-producing operations until a minimum of workers are exposed Substitution of less toxic materials is a well recognized procedure for control of occupational diseases, and it can be applied in foundries by elimination or reduction of free silica in moulding and core sands, parting powders and abrasives Wetting agents are used to reduce surface tension of water and increase wettability of materials; these wetting agents can be obtained commercially in concentrated liquid form or as a solid in cartridges, the prepared dilution of the wetting agent, about 1 in 1,000, is sprayed through special nozzles to control dust at the point of origin, to prevent dissemination of settled dust, and to remove airborne dust as in shake-out operations, especially of large castings

The subject of *Respirators* was dealt with by A J. KAIMALA The most important use for respirators in foundry work is where protection is required intermittently, as in cleaning castings, pouring metals,

respirator is an emergency device which requires adequate training of the wearer, it is the only type which protects from gases, dust, fumes and smoke,

from odours, rust, scale and water-mist that may come from the compressor system; precautions to be taken

and performance of respirators, and they examine and test respirators for conformity with these requirements. Maintenance of respirators may be either by the individuals using them, under instruction, or by a central system for cleaning, sterilizing and repairing all respirators A procedure for cleaning, sterilizing, and storing respirators is outlined

Ventilation Principles were described by W N WITHERIDGE This important contribution is a systematic, technical treatise addressed to ventilating engineers. The main aspects of the subject dealt with are (A) natural general ventilation (dilution) by (1) anemotive ventilation, unreliable in most locations, (2) thermal or gravity ventilation, which should be limited to high-temperature processes (B) Mechanical general or space ventilation (dilution), by (1) supply, pressure or plenum ventilation—it is exceedingly difficult to pressurize most industrial establishments, (2) exhaust, suction, or vacuum ventilation, commonly by motorized roof or wall ventilators (C) Local dilution ventilation by supply or by exhaust (D) Ventilated process enclosures, complete or partial, with worker inside or outside (E) Local exhaust hoods, updraft, sidedraft, downdraft, narrow slot, spot or point exhaust, special contour or close-fitting hood, and integral local exhaust hood built into machine, often inadequate (F) Combination supply-exhaust systems Natural *versus* mechanical ventilation, general *versus* local ventilation, and cross ventilation were discussed Technical subjects dealt with include balance between exhaust and supply, duct velocities and air-flow dynamics, radiant heat and man coolers, and recirculation, this last point was elaborated and conditions were outlined where recirculation should and should not be considered The final point was on co-ordination of atmospheric control, and emphasis was placed on the advantage of making someone responsible for complete co-ordination of the entire air-handling equipment A programme for indoor and outdoor atmospheric control for a foundry will not be a notable success unless it engages the special interest and concern of one competent individual The article is illustrated

The next section dealt with problems of Ferrous Foundry Practice

R H MOORE presented a paper on *Sand Handling* which includes transportation and delivery of sand to each operation Moulding sand is bonded with clay, made plastic with water, and manipulated in the sand mixer In the moulds very small quantities of clay are vitrified in contact with the molten metal and, if allowed to accumulate, close the space between sand grains and prevent release of gases which cause blow holes and other defects in the casting Sharp silica sand for cores is bonded with thermal-setting combustible binders which disintegrate so that the core can be readily removed. The moisture content of shake-out sand ranges from ½–5 per cent, and its temperature may range from 100°–650°F. and it may contain chunks of red-hot metal Much of the fines in shake-out sand must be removed and exhausted to make working conditions tenable and to remove health hazards Fractionating chambers are arranged so that the heavily dust-laden air is separated from the smoke, fume and steam and can be exhausted through a multiwash dust collector, the smoke, fume and steam being discharged directly to atmosphere The equipment for the mechanical movement of moulding and core sands is described and illustrated in 17 photographs and drawings

An article on *Core-making and Moulding* was presented by G E. TUBICH This has special reference to health conditions and is well worth study Moulding and core-making are not essentially dusty jobs, because the materials are handled in a damp state Subsequent operations, such as application of parting compound, spraying of wash compounds, and cleaning of patterns and moulds with jets of compressed-air are dust-producing, sand-slinging releases more dust than other moulding operations There is a risk of dermatitis among core makers from contact with oil and synthetic resins Studies have shown that the incidence of pulmonary fibrosis among moulders is high whereas among core-makers it is low; these 2 groups form about 25 per cent of about 45,000 workers in the ferrous foundry industry in Michigan The processes are described in detail. Parting compound may have 90 per cent free silica; many foundries are now using non-silica materials, such as calcium carbonate, or phosphate, and others Facing compounds brushed, swabbed or sprayed on the face of a mould may contain silica-flour; spraying should be done only in a booth with exhaust. The shell-moulding process is described; the method uses a thermosetting phenol formaldehyde resin for bonding the silica grains to produce a thin-walled mould Special clays and mixtures of clays are mentioned as having been investigated as moulding materials Core-sand contains about 85–90 per cent free silica; the airborne dust in core-making operations is in the range of 12–15 per cent free silica and about 95 per cent of this is below 3 μ in size Machine core-making operations show slightly higher dust concentrations than do hand core-making operations The basic material in core and mould washes is silica flour, many less hazardous materials can be used such as fused alumina, magnesite, sillimanite and zirconium, tellurium has been used for specific conditions, but its use should be closely supervised; its compounds can be extremely toxic especially when subjected to high temperatures. Reference is made to the occurrence of dermatitis from contact with urea- and phenol-formaldehyde resins used as core binders

J C RADCLIFFE submitted a paper on *Metal Melting and Pouring* He dealt with the risk from silica dust in chipping and dry-cutting of silica-bricks in furnace repair A recent radiological review of personnel in a gray-iron foundry showed 100 per cent more pneumoconiosis, not necessarily silicosis, among the bricklayers than among other foundry workers in similar age and employment groups Dust counts are normally over 5 million particles per cubic foot (MPPCF) in dry chipping and mechanical cutting of bricks. The hazard can be controlled by

the use of approved respirators for short exposures, and by exhaust ventilation at dry saws; an illustration shows a saw with a fan installation which reduced the dust concentration from 70 to 12–20 MPPCF Cutting with wet-cutting disks produces dust concentrations near the allowable limit The cost ratio of dry disks over wet ones is about 7 to 1

material is forced through a hose and sprayed on the inner surface of the cupola, the operator inside wearing an air-supplied breathing apparatus The slurry contains 30 per cent clay and 70 per cent silica Dust counts ranged from 70–620 MPPCF, with an average of 375 MPPCF Exposure to radiant heat from red-hot metal can be controlled by aluminium-type shielding (not asbestos or sheet-metal). For pourers aluminium cloth aprons, and shields on the pouring ladles, reduce exposure to heat.

J M. KANE submitted a paper on *Shakeout and Core Knockout* which deals with the engineering methods for control of dust in these processes Present-day foundry practice had demonstrated the feasibility of centralizing these operations By this system local exhaust ventilation can provide economical and effective control of dust, fumes and gases Mechanical methods are used increasingly for turning out castings and this has permitted more complete exhaust enclosures with positive control and economical use of exhaust volumes A table gives usual ventilation rates for shakeout and core knockout and indicates the types of equipment used, the points at which exhaust is applied and the direction and amount of ventilation, 26 photographs and line-drawings illustrate these methods

W W. DODGE submitted a paper on *Casting Cleaning* in which he dealt very fully with physical hazards from injury to feet, eyes and hands, and with health hazards from dust, fume and vapour, and from noise, and discussed methods of controlling these hazards;

Grinding The grinder most commonly used is a double horizontal spindle stand grinder, with a wheel varying in size from ½ in to 36 in , and is used to remove excess metal from the smaller castings The swing-grinder removes large quantities of metal from castings placed on the floor A booth is recommended for swing-grinders which allows freedom of operation Portable grinding done on a bench can be controlled easily; this applies also to horizontal and vertical spindle grinders, by means of suitable hoods and baffles to improve exhaust and restrict flying material It is essential that the proper volume be drawn through the hoods, and to ensure this the design of the duct work and the correct fan capacity are important Photographs and drawings give details of measurement, design and arrangement

The final section dealt with Non-Ferrous Foundry Practice

* * *

B D BLOOMFIELD gave an address on *Control of Non-Ferrous Foundry Dust Exposures* After a general survey of effective engineering measures for control of dust he divided the subject into local

one of the most important phases of dust control in the foundry Respirators were needed when other means of controlling dust were not possible, as in sandslinging, they should be used as a last resource The subject of general ventilation and make-up air was discussed and possible defects were pointed out. The suspended type of unit heater can easily serve as a source of dust dissemination Dust collectors and recirculating of air after filtration were discussed, with regard to recirculation the author said, that although an economical measure in terms of heat, the fact that foundry dusts contain free silica makes the practice of recirculation inadvisable, it could be considered when the dust was free from toxic contaminants For foundry purposes the fabric-type collector appears to be the best choice Construction specifications are given for local exhaust systems for dust Numerous photographs and figures illustrate this valuable contribution

E L Middleton

Office [3s]

Welding is the process by which pieces of metal are joined together by melting the adjacent surfaces thro

fusic

gas

joined and an electrode, made of metal. The electrode is made of carbon in carbon-arc welding In atomic-hydrogen welding, a stream of hydrogen is blown

inhale metal fumes, such as *zinc oxide* during the welding of galvanized articles, "metal fume fever" may result.

Many investigations have been reported into the health hazards of welding, and these are reviewed in the report now issued. 247 male welders were examined, of whom 180 were X-rayed The average age of the group was 34 and the average length of welding was 12·7 years, 183 were electric welders; 39 were gas welders; and 25 were mixed welders. Literature has established that ultra-violet rays generated by the arc will cause temporary kerato-conjunctivitis with photophobia and lachrymation, seldom lasting more than 24 hours Welding in confined, unventilated places (which is always to be avoided), may lead to gassing by nitrous fumes, or

changes had performed a substantial amount of their work in enclosed spaces. Some men who had previously shown changes were re-examined after an interval of years, and showed no increase in the intensity of the lesions, in one case definite signs of pneumoconiosis had entirely disappeared, his films are reproduced.

Welding was not found to play any significant part in producing indigestion in the group of welders under review. The same applied to rheumatic conditions and to involvement of the central or peripheral nervous system Further, analysis of observations suggested that the work of welding does not lead to any impaired exercise tolerance. Haemoglobin counts were very satisfactory, and no abnormal red or white blood cells were encountered. Available statistical evidence suggested that welders were favourably placed in regard to their sickness rates, compared with non-welding workers Although this investigation does not incriminate welding as a

ferably by exhaust draught, of confined spaces in which gas torches are used or in which dangerous or irritating fumes are liable to be evolved.

E. L. Collis

VORONTSOVA, E. I **[The Effect of Dust formed during Welding with Manganese Electrodes]** *Gigiena i Sanitariya* Moscow. *1949, No 4,* 24–30 [In Russian]

Working conditions during the use of manganese electrodes for welding have been investigated in a large-wagon building works in Russia; 28 welders worked in a shop 172,500 cubic metres in volume,

nitrogen and carbon in the air in various situations The air round the welding site contained 65 mgm. of dust per cubic metre; 97·5 per cent. of this consisted of particles smaller than 1 μ The dust con-

after exposure for three

were not much affected.

Forced air extraction was found to be ineffective in reducing the dust content of the air, ventilation at the rate of 200 air changes an hour did not produce a satisfactory effect in a closed welding cabinet when large pieces of work were being welded Supplying compressed air from a hose gave much better results; in a test of one such installation the dust content reduced from 14·11 mgm

most suitable.

SILV ... Nitrogen

in footnotes.]

An investigation is described in which a study was made of the formation of oxides of nitrogen from atmospheric gases during arc welding of steel. Of these oxides NO_2 is considered to be the most injurious

oxides. These methods are described and charts are

Montesano, G Sindrome polmonare acuta da saldatura ad arco. [**An Acute Pulmonary Condition caused through Welding by Electric Arc**] *Med. d Lavoro.* 1950, Aug-Sept., v 41, Nos 8/9, 225–9 [14 refs.] English summary (5 lines).

In welding by this process, heat is generated by an electric arc which is set up between an electrode and

from oxidation The composition of the flux

process without suffering any apparent harm.

After handling the new process for 5 weeks, the workman was suddenly overwhelmed by the fumes from the electrode and complained of "choking", burning at the throat and retro-sternal tightness. He was given first-aid and then admitted to hospital. His respiration was shallow and frequent, he had a sharp cough, with an increasingly abundant frothy reddish sputum, cyanosis, a small and frequent pulse and a sense of constriction at the chest. A temperature of 39°C. was recorded within an hour or two of admission and the symptoms became worse. X-ray examination, a day later, showed a mass opacity of the lower and part of the middle lobes of the right lung with accentuation of the shadow given by the pulmonary "network". A diagnosis

stay in hospital

It is suggested that this welder occupied a particularly confined space in a corner of the workshop and that there were individual psychological and other constitutional factors to account for this being the

many cases of pulmonary oedema have been recorded from such vapours *J. Cauchi*

D'Onofrio, V. & Passeri, A. Sulla pneumoconiosi dei saldatori ad arco Contributo clinico-radiologico [**Pneumoconiosis due to Welding by Electric Arc**] *Rass. Med. Indust.* Turin 1950, Nov-Dec, v 19, No. 6, 276–80, 4 figs. [11 refs.]

In this method of welding, the electrodes reach

SECTION IX

PNEUMOCONIOSIS DUE TO OTHER INORGANIC SUBSTANCES

Aluminium—Other Non-ferrous Metals—Beryllium—Kieselguhr and Fluorspar—Cement—Sulphur and Baryta

BAADER, E. W. Die Aluminiumlunge. [**The Aluminium Lung**] *Ztschr. f. Unfallmed u. Berufskrankh.* 1949, June 15 & Sept. 15, v. 42, Nos 2 & 3, 79–95, 186–96. [27 refs]

The paper gives a general review of our knowledge of lung disease due to aluminium. The first case was that of an aluminium paint sprayer, observed and demonstrated by Baader in 1934 Since 1938 an increasing number of cases arose from the manufacture of aluminium powder in the Rhineland. Finally the disease was found in workers on arc furnaces fusing bauxite for manufacture of synthetic corundum, both in Germany and in Canada

The disease caused by powdered aluminium was studied by GORALEWSKI, KOELSCH, JAMIN and MEYER. During a radiological survey of 628 workers [illegible] cases of X-ray abnor- [illegible] ections by [illegible] rogression, [illegible] from the beginning of symptoms Exposures may be as short as six months or as long as 16 years.

Detailed descriptions of a number of case histories are given.

The disease is believed to be caused, according to JAEGER, by the coagulation of protein by aluminium ions, the animal experiments made by DE MARCHI and KAHLAU are reviewed.

A disease in corundum workers was described by SHAVER and RIDDELL in Canada and by WÄTJEN in Germany. The results in general are similar, but a complicating tuberculosis was found in the German workers only. The causation here is rather disputed as some German workers ascribe the disease to mullite, and further research is needed.

Disease due to aluminium dust has been compensable in the whole of Germany since 1943, and that due to aluminium compounds in the Eastern zone since 1947

G. Nagelschmidt

GORALEWSKI, G. Die Aluminiumlunge. Eine klinische Studie. [**Aluminium Lung. A Clinical Study**] *Arbeitsmedizin No. 26.* 1950, 68 pp, 23 figs [46 refs.] Leipzig : Johann Ambrosius Barth

In this monograph on a form of pneumoconiosis which he calls aluminium lung the author gives a review of the literature, an account of his own extensive observations on workers employed in the [illegible]

of reducing the amount of fine dust produced, and, by forming a film of aluminium stearate on each particle the metal was protected from the solvent action of salt. Aluminium powder was also prepared by hydraulic spray, when the particles produced were large and crystalline

In the examination of 628 workers 28 gave a history of long-standing tuberculosis ; in more than a third there were histories of acute inflammatory processes in the lungs and pleura, and of influenza and bronchitis, annually recurring attacks of bronchitis were not infrequent.

Subjective symptoms did not usually correspond with objective signs ; sometimes with well marked X- [illegible] complained of, and [illegible] oea and [illegible] ms were [illegible] lmonary symptoms, complaints were made of rheumatic pains and gastro-intestinal disorders. The 628 workers were employed in three large and three smaller works, and, for the purposes of statistical comparisons, the smaller workers were grouped together, thus forming four groups. Data are given of age, duration of employment in the industry and in the particular process.

In the clinical examination the outstanding [illegible] the discrepancy between the [illegible] of the [illegible] spiro- [illegible] action [illegible] itation of the respiratory passages, with cough and sputum ; this apparently harmless reaction should not be disregarded in the aluminium powder industry ;

experience showed that a serious pathognomonic

phragm, pleura and pericardium; spontaneous pneumothorax was not infrequent, respiratory insufficiency resulted from the infiltration and distortion and led to failure of the circulation and especially of the right heart At this advanced stage aluminium lung resembled silicosis, except that in the former the development from the early to the late stage was much more rapid. (A case is described showing development in 8 months, and ending fatally with spontaneous pneumothorax)

A theory put forward by JAMIN, and recent animal experiments by JÖTTEN, suggested the possibility of aluminium lung depending on an allergic reaction Of the 628 aluminium workers examined by the author

Diminution of respiratory function in the advanced stages is so obvious as to render spirometric measurement unnecessary, but for early diagnosis tests are useful. In only one works in this series was it possible to carry out tests for respiratory function, in 35 2 per cent of those examined the respiratory value was at or under normal, and in 21·5 per cent the vital capacity was at or under normal values In 11 workers re-examination after one year showed a further reduction in respiratory values in every case In cases in which the X-ray did not show

data and, in addition, the vital capacity, lymphocyte and eosinophile counts and erythrocyte sedimentation rates The radiographic changes in aluminium lung begin with increase of linear striations in the form of a fine network, soft foci with indefinite outline develop in the network and aggregate to form cloudy shadows; at the same time the striations increase at the diaphragm and around the heart shadow, the diaphragm shows peaking, and the

nexion between tuberculosis and aluminium lung, and the influence of the two processes on each other, has not been fully investigated and calls for research in view of its importance from the clinical and compensation aspects.

The pathological change in aluminium lung is a

the two processes.

industry and in corundum furnace work, and occurs especially in certain of the occupations. The clinical picture presents a few symptoms, only a relative lymphocytosis in the blood picture and an early

vanced stage, the deformity of the diaphragm and the heart outline resulting from damage to the elasticity of the lung leading to considerable distortion A correlation between the duration of employment and the severity of the disease has not been established.

Prophylactic measures recommended include radiographic examinations with a view to considering suspension from the processes of workers

MÖDDER, H & SCHMITT, T. Eine neuerliche Erweiterung der Aluminose. [A Recent Extension of Aluminosis] *Deut. med. Woch* 1951, Jan. 19, v. 76, No 3, 84-7, 2 figs.

Examinations were made of 97 workers employed in the manufacture of aluminium alloys, there were three processes: (1) pressing clay, quartz and charcoal; (2) refining the mixture to 61 per cent. aluminium and 37 per cent silicon; (3) further refining at a temperature range of 1,200–1,300°, in which fumes were given off. In the same room alloys with copper, manganese and other metals were made

The results of the examinations showed that only in the third process, that is where the workers were exposed to furnace fumes, were serious pulmonary

... of tuberculosis In the remaining 18 the

... changes were less marked than

and corundum workers' lung; in one case there was, in addition, an appearance not hitherto described in

(658°); however, the possibility of a reaction from the silicon could not be ruled out.

E. L. Middleton

... Weitere experi- ... r Lungen- [Further ... Hazard of ... zkt 1950, ...]

Previous work by Jötten and Eickhoff [this Bulletin*, 1943, v. 18, 57, 1944, v. 19, 120] had shown that dust inhalation of paraffin-free aluminium by rabbits led only rarely to more than a foreign- ... combination with a cold or ... brosis of the ... pathological ... o aluminium ... omitted dust during the war, when paraffin ...

*v. II, 213 *bis*

In order to assess the value of the paraffin coating, two new series of rabbit experiments were carried out during 1947 and 1948, with aluminium powder containing 0·1 and 1 per cent of paraffin (ceresine)

The dust (I) with 0 1 per cent of paraffin was finer but aggregated and less dispersible than the dust (II) with 1 per cent of paraffin [The description of these dusts is confused under the Table headings on pp 149/150] The dust exposures were ½ hour daily, six times per week, and the dust concentration was 80 mgm. per cubic metre. After one year some

... dipping ... repeated once after six months and survivors were killed after an overall time of two years

Intercurrent deaths in the early months were compensated by adding more animals to the experiments

The paper deals mainly with the general results, and a detailed histological report will be published later The main criterion is diffuse fibrosis of interstitial tissue which can only be ascribed to aluminium after at least 75 days of dusting It occurred only rarely and after a long time as a result of dusting alone, but more frequently as a result of dusting plus infection.

Both paraffin-coated dusts acted far less strongly than the uncoated dust which had been used previously, and the coarser dust (II) with 1 per cent paraffin in the new series was more active than the finer dust This is due to better dispersibility of dust (II) as evidenced by the finding of more copious dust deposits in the alveoli after comparable exposures

An overall comparison of the old and new experiments giving per cent. fibrosis is as follows :—

Paraffin	Jötten-Eickhoff none	van Marwyck-Eickhoff 0 1 per cent.	van Marwyck-Eickhoff 1 per cent.
Al alone	15 (5)	0 (0)	17 (3)
Al and infection	80 (4)	33 (3)	100 (2)

The figures in brackets are the numbers of animals with fibrosis

G. Nagelschmidt

Jullien, G., Vallecalle, E. & Leandri, M. La nocivité de l'hydrate d'alumine en inhalation et son action sur le tissu pulmonaire. **[The Toxicity of Hydrate of Aluminium when Inhaled and its Reaction with Pulmonary Tissues]** *Arch. Malad Professionnelles.* Paris 1952, v. 13, No 1, 31-8, 3 figs

The claim has been advanced that powdered hydrate of aluminium inhibits the toxic action of silica upon the lungs. The silica becomes coated with aluminium and so does not react with the pulmonary tissues: this coating may be demonstrated

by staining with aurine. One gritstone was toxic; another, which only differed by containing oxide of aluminium, was far less harmful. Trials on workers by introducing aluminium dust alongside the silica have given dubious results Indeed, some workers have claimed that the remedy is worse than the disease The authors have already shown that aluminium hydrate may exert an antispasmodic effect, like histamine, causing broncho-dilatation similar to that induced by adrenaline This action may explain the apparently favourable results obtained with silicotics.

In order to test the matter further, the authors [illegible]

[illegible]

cells loaded with particles of the dust and exhibited every stage of cellular degeneration Such alveoli exist in masses which constitute nodules These changes are shown in illustrations and seem to be reactions to the dust particles which cannot be unloaded from the pulmonary tissues Hence arises a thickening of the alveolar walls without any tendency to fibrosis These specific lesions vary with the amount of dust inhaled and the length of time the inhalation lasts. They extend to the pulmonary glands The conclusion drawn is that the dust of hydrate of aluminium when inhaled exerts a harmful influence [No suggestions are made as to whether the damage done interferes with the functions of the lungs or with the tendency to succumb to tuberculous infection] *E L Collis*

KING, E J, HARRISON, C V, MOHANTY, G P & NAGELSCHMIDT, G **The Effect of Various Forms of Alumina on the Lungs of Rats.** *J Path & Bact* 1955, Jan-Apr, v 69, Nos 1/2, 81–93, 17 figs (1 coloured) on 5 pls [35 refs]

After a review of the conflicting reports in the literature on the effects in the lungs of various forms of metallic aluminium and alumina, experiments are described in which the authors tested the effect of alumina, $AlPO_4$ and corundum fume in the lungs of animals The materials used were (1) hydrated alumina as used by GARDNER *et al* [this *Bulletin*, 1945, v 20, 204]; (2) fume from a corundum furnace, supplied by an abrasive factory, (3) aluminium phosphate ($AlPO_4$) prepared in the laboratory The samples were examined by light and electron microscopy, X-ray and electron diffraction and chemical analysis, in order to determine size distribution, [illegible]

[illegible]

modified by KING *et al* [this *Bulletin*, 1946, v. 21, 242, 1948, v. 23, 109] Routine examination was carried out on the rats which died or were killed; sections of the lungs were stained by silver impregnation for reticulin, haematoxylin and eosin, and by IRWIN's aurine staining method for aluminium, one section was kept for micro-incineration and one for Gram's stain in some cases to exclude infection In assessing the degree of pathological change 5 grades of fibrosis were recognized, depending chiefly on the presence and amount of collagen, and the reticulin and cellular structure

The gross apearance of the lungs of the animals that were killed presented an almost uniform appearance in all the experiments sub-pleural, greyish collections of dust from 1 to 5 mm in diameter, remain- [illegible]

[illegible]

appearing in a tangled network without any pattern Aggregates of dust particles were present in the alveoli and in the perivascular and peribronchial lymphoid follicles The amount of alumina shown [illegible]

[illegible]

lymphoid follicles Pre-fibrotic nodules were composed of [illegible] showed [illegible] fibres, [illegible] fibres we[illegible] due to alumina

With *hydrated alumina* histological examinations showed remarkably severe and rapidly developing pulmonary fibrosis, from the 60th to the 210th day progressively more severe lesions were seen; these became larger, collagen replaced reticulin and the [illegible]

[illegible] diminished

With *corundum fume* much less pulmonary fibrosis was produced, at 32–60 days the lesions increased in [illegible]

[illegible]

early collagen formation in some nodules; the majority of animals in the corundum experiment died within 8 weeks, and in these exudative reaction to the dust was very prominent, dust particles demonstrated by aurine staining gradually diminished towards the end of the experiment

Aluminium phosphate ($AlPO_4$) produced a moderate degree of fibrosis; at first dust-containing

*v. II, 151

†v. II, 107, 283.

phagocytes collected into rounded aggregates in which were reticulin fibres which increased gradually in number and thickness and at 270–390 days the lesions were cellular and stellate but the amount of reticulin and collagen was not much increased; at 410 and 440 days the nodules had become partly acellular and many reticulin fibres were replaced by collagen, in the later stages the amount of alumina demonstrable by aurine staining was certainly less, suggesting that the aluminium phosphate particles were being dissolved and eliminated from the lungs

"The introduction of aluminium hydrate into the lungs of rats caused massive fibrosis, aluminium phosphate produced a milder but similar and definitely fibrogenic reaction The corundum stack fume acted somewhat differently. Many of the animals died during the first weeks of the experiment and the strong exudative reaction to the dust was very prominent Thus the stack fume is an acutely reacting rather than a chronic pneumoconiotic agent This may be due to its glassy nature, its small size or its chemical composition In view of the negative results obtained by DENNY *et al.* (1937, 1939) [this *Bulletin*, 1938, v 13, *702] and GARDNER *et al* [*ibid*, 1945, v 20, 204] the present findings with aluminium hydrate came as a surprise"

The main conclusion reached is that certain forms of alumina may produce fibrosis of the lungs nearly as severe as can be produced by quartz Recent work †by JULLIEN *et al.* [*ibid*, 1952, v 27, 864] supports these findings. Since very large doses of alumina were used in the experiments the results cannot be related to the prophylactic use of alumina in silicosis, where relatively minute quantities are used The findings do, however, bear some resemblance to the lesions reported in the lungs of some workers exposed to alumina dust

[In view of the conclusions reached as a result of clinical and radiological examinations in 1936–7 (see ‡this *Bulletin*, 1937, v 12, 179, SUTHERLAND *et al*, *ibid*, 1938, v. 13, 15) the use of alumina was introduced as a "safe" substitute for calcined flint in the placing of china biscuit-ware in the pottery industry §(see Ann Reports, Chief Inspector of Factories, 1938, 1943 and 1944, this *Bulletin*, 1945, v 20, 141, 1946, v. 21, 179), the results of the present experiments are disturbing, and a re-assessment of the dust exposure and control in the china branch of the pottery industry appears to be indicated.]

E L Middleton

DÉROBERT, L, CECCALDI, P F, MARTIN, R, RIMSKY, A., VACHER, J & VICHNEVSKY, Y L'examen des poumons des rats exposés aux poussières de polissage d'hélices en duralumin **[The Analysis of Lungs of Rats after Exposure to Dust from Polishing of Aluminium Propellers]** *Arch Malad Professionnelles* Paris 1955, v 16, No 2, 108–9, 1 fig

In order to test whether a pneumoconiosis hazard existed in the polishing shop of a certain aircraft factory, 6 rats were placed permanently for 8 months near the head of a workman. Histological examination of their lungs showed considerable abnormalities, enlarged lymph nodes, alveolitis, many macrophages and in one case bronchopneumonia. Histochemical tests did not show any aluminium on the ordinary or ashed slides, but X-ray diffraction analysis of the lung ash of the rats showed the presence of all the elements constituting the aluminium alloy and the abrasive used.

It is concluded that the rats inhaled polishing dust which could be harmful and that adequate dust control at the working place would be necessary

G. Nagelschmidt

HAGEN, J. Ueber Lungenveränderungen bei Korundschmelzern. **[Changes in the Lungs of Corundum Smelters]** *Deut med. Woch.* 1950, Mar. 24, v. 75, No. 12, 399–400.

Until a few years ago corundum, an artificial abrasive containing aluminium was not known to have a health risk, but, during the last war and the years which followed, a series of severe and sometimes fatal cases of lung disease occurred among workers in the aluminium industry in central and west Germany. Altogether 25 cases were reported by doctors.

In west Germany corundum was prepared by smelting imported bauxite or calcined clay in closely placed electric furnaces After 60–80 hours the corundum formed a solid block in the furnace and was removed by a crane while still glowing; after cooling, the mass was broken up Investigation showed that the lung disease occurred exclusively among the furnace workers and the cranemen; among 25 suspected cases, 15 were found to have this occupational lung disease and of 10 furnace workers 7 died. Evidence of the disease was first found in 1942 and this was attributed to bad conditions of work, intensive production and increased hours of work.

The chief symptoms were cough and dyspnoea; in three cases spontaneous pneumothorax occurred and in these the progression of the disease was rapid Objective signs were not characteristic; in six cases there was marked bronchitis Vital capacity was reduced, and the erythrocyte sedimentation rate was increased. Active tuberculosis was present in five cases. Radiographic changes included enlargement of hilar shadows; increased linear markings; fine or medium stippling, and distortion in the middle zones, peaking of the diaphragm was sometimes bilateral

In seven autopsies the lungs were shrunken, slate-grey and fibrotic Histologically there was fibrotic thickening of the alveolar septa, with hyaline change and destruction of air cells Silicotic nodules were not found Chemical analysis of the lungs showed a marked increase of alumina and silica.

The aetiology of the smelters' lung is discussed and contrasted with the condition found in the lungs of workers exposed to dust of metallic aluminium. It is assumed that in the smelter's lung the aluminium ion enters into an irreversible combination with the

*v. II, 151. †See above ‡v II, 171, 172. §v II, 418, 421 *bis*

Med, 1947, 516) that when bauxite is heated a very reactive compound is formed below 960° which is altered by higher temperatures. This hypothesis would explain the changes produced in the lungs of the smelters, and the contrast with workers exposed to metallic aluminium dust. The increase in the quartz content of the lungs may be of importance, because of the temperature of 2,000° reached in the furnaces gaseous silica is given off and, in this state, would have a more rapid action on the lung tissue than crystalline quartz. In the case of these smelters there is possibly a complex action by aluminium and amorphous silica

Compensation is not yet provided for occupational disease of the lungs due to compounds of aluminium as is done for disease due to metallic aluminium, but statutory provision for notification and compensation is in preparation *E. L. Middleton*

GÄR

footnotes]

A summary is presented of publications dealing with the occurrence of pulmonary disease among men producing corundum from bauxite, and a discussion of the agent considered to be at fault. The observations are reported from Canada and

The pulmonary condition caused has been ascribed

Arguments are advanced for and against different agents being at work without certainly incriminating

HARDING, H E & MCLAUGHLIN, A. I. G. **Pulmonary Fibrosis in Non-Ferrous Foundry Workers.** *Brit J. Indust Med.* 1955, Apr, v 12, No 2, 92–9, 10 figs [11 refs.]

Foundries for non-ferrous metals deal with such copper alloys as brass, bronze and gunmetal, as well as alloys with an aluminium or magnesium base When siliceous parting powders are used the men are exposed to harmful dusts which may even cause a pneumoconiosis similar to silicosis, but more frequently the resulting lesion is that of mixed-dust pneumoconiosis. Now the use of parting powders containing more than 3 per cent. of compounds of silicon is prohibited

The case histories of 6 men in non-ferrous foundries are described; 4 of the men were moulders and 2 were casters Such men had been exposed to

microscopic appearances of the lungs are well illustrated One case with definite tuberculosis showed well-marked silicosis Two died from right-heart failure, and cor pulmonale The lungs of 2 brass dressers showed silicotic nodules, but one of the men died from coronary thrombosis All exhibited some fibrosis and mixed-dust pneumoconiosis The conditions found in the lungs were undoubtedly occupational, but which component of the dusts inhaled was the factor to blame is uncertain Other materials besides silica may set up fibrosis *E L Collis*

PERRY, K M A **Pulmonary Disease in relation to Metallic Oxides.** *Lancet* 1955, Sept 3, 463–9 [Numerous refs]

The facts presented are grouped under two headings; first according to the metallic dusts which gain access to the lungs, and then according to the pathological results which follow The heavier metals, the dusts of which throw X-ray shadows, the density of which varies w

be inert

example

general

silica

irritate the lungs, causing a benign pneumoconiosis. The same may be said of stannosis, due to oxide of

incidence of pneumonia among workers exposed to manganese dioxide dust Vanadium pentoxide may set up acute bronchitis; and the same may be said of *osmium tetroxide* Beryllium has *recently* been blamed in America for causing serious pneumonitis even among those living near a factory where beryllium was being used as a valuable metallic alloy. The resulting condition is named beryllium sarcoidosis, and it may develop after exposure It is claimed that cadmium dioxide sets up an unusual

form of central emphysema, associated with impairment of respiratory function. Observers disagree about alumina, oxide of aluminium. Some have claimed *it to be beneficial in preventing silicosis when mixed* with silica; others have described extensive fibrosis with profound emphysema and bronchiectasis, resulting from exposure to fumes of bauxite and silica.

Pulmonary carcinoma has been attributed to various dusts, in particular to pitchblende and radium when mining The radio-activity of the dust has been blamed and so has its arsenic content Certainly other dusts with no radio-activity but containing arsenic, *as in the preparation of arsenical sheep-dips,* have been found associated with a high incidence of pulmonary carcinoma. Probably both in their turn are carcinogenic The same may also be true of monochromates. Arsenic in cigarette fumes may *account for the excess of lung cancer in smokers* The conclusion of the matter is that the air we breathe should be free from all forms of contamination whether as dusts or fumes, particular attention being directed to the harmful effects of atmospheric smog

E. L. Collis

SJÖBERG, S. G. **Health Hazards in the Production and Handling of Vanadium Pentoxide.** *Arch. Indust Hyg. & Occupational Med.* Chicago 1951, June, v. 3, No. 6, 631–46, 1 fig. [Refs in footnotes.]

Vanadium is coming more and more into use, chiefly as a hardener *of steel, although it may also*

soluble in water. Dust varied from 0 6 to 86 9 mgm. per cubic metre of air with a vanadium content of 4·8 to 7·5 per cent. Many of the particles were fine

... No danger was expected ... rred. ... with ... cough ... moea,

air passages being primarily affected These experiments confirmed the clinical observations made on the workers No certain evidence was observed of *chronic general poisoning.* The conclusion is that vanadium pentoxide can cause disease of a relatively mild nature, of which the prognosis is favourable. Mild chronic inflammatory changes may occur in the upper respiratory tract; some allergic lesions of the skin may be present. Industrially the dust should be kept under control

E. L. Collis

LUNDGREN, K D. & SWENSSON, A. **Experimental Investigations using the Method of Miller and Sayers on the Effect upon Animals of Cemented Tungsten Carbides, and the Powders used as Raw Material.** *Acta Med Scandinavica* 1953, Mar. 28, v. 145, No 1, 20–27, 22 figs on 13 pls. [19 refs]

"In view of the clinical experience favouring the assumption that a form of pneumoconiosis may appear in consequence of exposure to cemented tungsten carbides or the powders which are used as raw material

MILLER, C. W., DAVIS, M W., GOLDMAN, A. & WYATT, J. P. **Pneumoconiosis in the Tungsten-Carbide Tool Industry. Report of Three Cases.** *Arch Indust. Hyg & Occupational Med.* Chicago 1953, Nov , v 8, No 5, 453–65, 4 figs [Refs in footnotes]

Tungsten carbide is extremely hard, and tools tipped ... to be carried out ... speed steel ... ipped with ... the manu- ... ıalt (7 per ... in the final tools) is added ... he *literature to* ... rs employed in ... have found no ... n. They now ... ve encountered

All three men were engaged in various *grinding* operations to sharpen the finished tools, which contain about 7 per cent. cobalt. Dust counts taken in the breathing zone of an operator who was doing fine grinding varied between 3 7 and 7 7 million particles per cubic foot, but at the rough grinding *machines* the counts were 38 to 40 million particles per cubic

foot [there is no indication of the numbers of dust samples on which these statements are based]. Various samples obtained with an electrostatic precipitator were analysed Cobalt was found to the extent of 1 to 2 mgm per 10 cu m of air, but the amount of tungsten present in the samples was too small to be estimated quantitatively [the volume of air sampled is not stated]

Two of the men complained of chronic cough, and all three of some dyspnoea The radiograms of all three showed increased lung markings Tests of respiratory function made on two of the men are

the albumin-globulin ratio was about 1 0 in each case, which seems to exclude sarcoidosis

All three patients have been stable and asymptomatic since removal from exposure to the industrial dust. Study of the results of the pulmonary function tests leads to the conclusion that in the two patients so tested there was considerable interstitial and parenchymal

Thomas Bedford

SPENCER, G. E. & WYCOFF, W. C **Benign Tin Oxide Pneumoconiosis.** *Arch Indust Hyg & Occupational Med.* Chicago. 1954, Oct, v 10, No. 4, 295-7, 1 fig.

Previous cases are mentioned in which X-ray appearances have indicated pneumoconiosis when the patient has been exposed to dust of tin oxide [this *Bulletin*, 1948, v 23, 667; 1950, v 25, 41]. In these cases no symptoms would have drawn attention to the lungs had not an X-ray been taken The case now reported is of a man aged 73, who had retired because of his age; for 11 years before, his occupations

illustrated, showed a curious fuzzy shadow all over both lungs *The existence of such extensive findings* was quite unexpected The extremely dense mottling throughout the lungs is attributed to the tin oxide

without considering the occupational history.

E L. Collis

*v II, 261, 262

AGATE, J N **Hazards in the Use of Beryllium and its Compounds** *Brit. J. Indust Safety.* 1949, No. 9, 131–4.

A general account.

HUNTER, D. **Berylliosis.** *Arch. Belges Méd Sociale, Hyg, Méd. du Travail et Méd. Légale* 1950, July, v. 8, No 7, 433–41, 4 figs. (2 on pl) [12 refs]

long as smelting processes are carried out wet no hazard exists, but, when briquettes are crushed, furnace dross is manipulated, and castings are cleaned and ground, fumes and dust arise A process recognized as particularly hazardous is the manufacture of fluorescent lamps Powders, used as phosphors, are prepared and mixed, they contain zinc beryllium, manganese silicate, zinc beryllium silicate and beryllium oxide Tubes used for electric signs are coated with a liquid suspension of phosphors and set to dry after which they are cleaned and the ends are brushed free of excess powder Cuts from broken fluorescent lamps may show an oedematous eruption, if a bit of this glass penetrates the skin, a subcutaneous granuloma may develop, only cured by excision of the particle

In addition to such lesions beryllium dust may set up dermatitis, conjunctivitis, irritation of the nose and throat with epistaxis, anorexia, dyspnoea, loss of weight, and also acute and chronic lung disease. Weeks or months may pass before abnormal signs appear in the lungs Once started, the disease progresses, one-third of the affected persons die; one-third are permanently disabled, the rest recover as

consideration. The threshold of danger is placed at 100 microgrammes per cubic metre of air. The case is mentioned of ten persons being affected, who were living in the neighbourhood of factories in which beryllium compounds were used.

E. L. Collis

POLICARD, A. & ROCHE, L. Sur quelques points des pneumopathies par composés du béryllium. **[Some Points regarding Disease of the Lungs Caused by Compounds of Beryllium]** *Arch. Malad Professionnelles.* Paris. 1950, v. 11, No. 2, 145–50, 4 figs

A short summary is given of the way in which beryllium dust reacts with the tissues of the lungs when it is inhaled, the description is pathological rather than clinical. An account of two cases of berylliosis is given, one of which was fatal These are the first cases reported from France since this chronic form of lung disease was described in U.S A. The fatal case was that of a man employed in breaking up beryllium and mixing it with charcoal and tar. The apparatus used was enclosed, but when it was being charged and emptied, and when it was cleaned, dust escaped into the air, and the man was considerably exposed to risk. He worked at this process about 3 weeks. He began to experience dyspnoea on effort, and mild cough. He became worse and was X-rayed some 3 weeks later. Micro-nodular shadows were seen with increased marking of the air-passages in the lower parts of both lungs The condition became quickly worse with dyspnoea and cyanosis, and some rise in temperature The case went from

significant shadows in the lower part of both pulmonary fields. All the symptoms in this case cleared away and the man was soon discharged from the hospital. X-rays of both cases are reproduced The suggestion is advanced that if the dust of a salt of beryllium is irritating (the chloride or fluoride) little is inhaled and less damage results than if a non-irritating dust is inhaled.

E. L. Collis

TRUHAUT, R Un nouveau problème d'hygiène industrielle : les intoxications par le glucinium ou béryllium **[A New Industrial Health Problem: Poisoning by Glucinium or Beryllium]** *Arch Malad Professionnelles.* Paris. 1950, v. 11, No 2, 158–77. [74 refs]

Glucinium is a little-used alternative name for beryllium. This long and comprehensive article brings together information regarding the metallurgy and uses of beryllium and its alloys. It is a useful compilation, although it does not present any new facts. The uses of beryllium and its alloys have been

Most of the acute cases have arisen in the recovery of the metal from its ore, beryl; chronic cases are ascribed to the manufacture of the fluorescent compounds Among the acute manifestations are included irritation of the upper air-passages, painful and tenacious cough, and dyspnoea; itchy dermatitis with oedema and vesicles, painful necrotic ulcera-

factory workers, but among persons living in the neighbourhood of a factory. An affected person develops a hard dry cough, loses weight, feels ill and becomes ill Slowly the condition advances to a sad fatality The lungs show a state of granulomatosis Why only a few of many seemingly exposed to the same hazard develop berylliosis calls for explanation. Prevention can only lie in bringing under complete control all dust and fumes generated in the various processes.

The different means which have been devised for detecting beryllium in the air and in organic matter are described; some are chemical, others spectro-

oxyfluoride salts of beryllium, but other compounds containing no fluorine seem to be equally toxic Much work remains to be done in elucidating this comparatively new occupational hazard.

E. L Collis

ALB.

The author, from the French Medical Inspectorate of Industry, presents the case for including in the list of recognized occupational diseases disturbances caused by beryllium and its compounds. Beryllium is known to originate acute and chronic troubles. Up to the present chronic cases have not been reported in France, as they have been abroad, especially in U.S A. The acute cases are various and include.—conjunctivitis with painful oedema due to dust; itching dermatitis on the hands,

and cyanosis due to anoxaemia These are associated with fatigue and loss of weight As the disease progresses X-rays show that the lungs are becoming invaded by a destructive change which invalidates

usually been engaged on the manufacture of beryllium oxyfluoride needed for fluorescent lamps and incandescent signs What is the toxic dose, and why it selects some and not others, are questions not yet

dust and fumes from furnaces be allowed free access to the air Gloves should be worn, goggles should be provided; efficient respirators should be used The workers should be instructed in the dangers which make these precautions necessary All workers should be X-rayed at least annually

E L Collis

MORGIS, G G & FORBES, J J **Review of Literature on Health Hazards of Beryllium and its Compounds** *U S Bur Min Inform Circ 7574* Wash 1950, July, 23 pp [38 refs]

This circular presents a review of literature pertaining to health hazards arising from beryllium poisoning Beryllium occurs in nature as a minor constituent of pegmatite ores, especially of beryl, a complex aluminium beryllium silicate, it is the basis of emerald gems It is found in many countries in small amounts and is coming into many industrial uses chiefly in alloys with copper Such alloys have high fatigue strength, high tensile strength and electrical conductivity, hardness and resistance to corrosion One particular use is in the production of fluorescent lamps, although for this purpose the less toxic cadmium is being substituted Many cases of berylliosis have been reported, due to direct contact with the skin, or to the action of its dust on the lungs, or to general toxaemia Contact with the skin will set up erythema of exposed parts and conjunctivitis; if the skin be abraded, particles may get in and cause indolent ulcers which heal only after the particles have been scraped away;

Inhaled dust containing beryllium or its salts may start pneumonitis soon after exposure, with an insidious, progressive cough, advancing to cyanosis, anorexia and prostration, ending fatally in two weeks, or slowly recovering after 5 weeks to 5 months. But the most puzzling are cases of chronic granulomatosis of the lungs which, after exposure, may have a latent period of 3 months to 5 or 6 years. This condition tends to come on very gradually, with loss of weight, weakness and anorexia, together with bouts of unproductive coughing and dyspnoea Cyanosis and clubbing become prominent as the heart feels the strain of the pulmonary obstruction. No remedy is known to halt the progress of the disease Diagnosis must always be difficult and can only be clinched if it is known that exposure has occurred The exposure generally is occupational; but a series of alarming cases have occurred among persons living in the neighbourhood of a factory producing beryllium, even as far as ¾ mile away Another

ated with closed-in apparatus and wet processes, but care must be taken not to discharge the collected dust freely into the air before it has been finely filtered Periodical medical supervision with X-ray examinations of the workers should be the rule, together with meticulous house-keeping wherever beryllium or its compounds may be manipulated Protective clothing, gloves and efficient respirators should be worn

E L Collis

TRU[illegible]

In 1934 the late Dr. Leroy U GARDNER, Director of the Saranac Laboratory and of the Edward L Trudeau Foundation, instituted the Saranac Symposia At the time of his death, in October 1946, he

had already made plans for the sixth symposium, and the record of the papers and discussions which form this volume is dedicated to his memory.

Three subjects were considered at the conference: The Beryllium Problem; Shaver's Disease; and Compensation for Occupational Disease. Of these the beryllium problem occupies over three-fourths of the volume. It comprises 29 formal papers, and discussions, which cover every aspect of the subject and, as the contributors include those who had done most of the work on beryllium disease, the symposium represents an authoritative and comprehensive treatise up to the time of the conference in the autumn of 1947, to this has been added a bibliography of the literature concerning beryllium published up to the end of 1949. The scope of the symposium can be shown best by mentioning the papers presented, but in a review it is possible to refer to only a few points which appear to be of special significance.

The History and Industrial Aspects were dealt with in five papers. History of the Beryllium Problem, by T. L. SHIPMAN; Beryllium Alloys, by A. J.

fundamental controversy concerning the acute form of the disease centres on the relative significance of beryllium and the acid radicals of certain salts. He concluded that beryllium in some form was the common denominator in the cases of pneumonitis, but beryllium alone did not explain all the facts and more data were needed

diagnosis was chemical pneumonitis

The Chronic or Delayed Disease was dealt with in seven papers. Clinical and Epidemiologic Aspects, by

to beryllium compounds, necessary, from tuberculosis, silicosis and Boeck's sarcoid, although the aetiology was not yet clear the evidence was accumulating which incriminated beryllium compounds [see also, by this author, The Character and Distribution in American Industries using Beryllium Compounds, p 914] Roentgenologic Aspects, by S. A. WILSON. The author gave guidance on radiological differential diagnosis, in which serial radiographs are valuable as well as a complete occupational history and

clinical and laboratory data. Physiological Aspects, by G. W. WRIGHT. The abnormality accounting for the dyspnoea was ascribed to an impediment to the transfer of oxygen across the interface of the lung, presumably in the alveolar membrane. Pathologic Aspects, by A. J. VORWALD. In a summary the

Workers, by O. A. SANDER. Postmortem Observations in Cases in which the Patients had been Exposed to Beryllium, by H. S. MARTLAND. This author referred to a case in which the large amounts of beryllium found in the skeleton suggested that although death in such cases was due to the lung lesions, beryllium was distributed through most of the body; the disease *therefore must be* systemic. He concluded that the existence of industrial beryllium poisoning was well established

Toxicity Studies in Connection with Atomic

was investigated primarily by means of liver function tests; abnormalities were found, but no type of test showed consistently high values for any individual. This section includes five papers on animal experimentation. A Review of Analytical Methods for Beryllium is presented by W. F. NEUMAN; An Analysis of Dust and Fume Hazards in a Beryllium Plant, by S. LASKIN, R. A. N. TURNER and H. E. STOKINGER; and Summary of the Beryllium Problem in Connection with Atomic Energy Production, by J. W. HOWLAND.

The Experimental Aspects included three papers: Animal Methods, by A. J. VORWALD. In a series of experiments certain compounds of beryllium produced a tissue reaction; but whether in the lung after

be known and to be done in regard to preventive measures. The sessions on the Beryllium Problem were concluded by B. L. VOSBURGH who touched on the leading points brought out by the symposium.

The second part of the *book* deals with Shaver's Disease, in three papers; on Clinical Aspects, by A. R. RIDDELL, Chemical Aspects, by C. M. JEPHCOTT; and a Summary, by T. F. HATCH. These

papers add little that is new to the material already [illegible]

Viewpoints of Workmen's Compensation Administration, the Insurance Viewpoint, the Management Viewpoint, and the Medical Referee's Viewpoint; to these are added an Introduction, and a Synthesis of Viewpoints. The papers and the discussions were, naturally, concerned with procedure and practice in the United States.

This volume is printed throughout on art paper which ensures good reproduction of the numerous illustrations, including five coloured plates, chiefly of chest radiographs and histological preparations. It provides a good alphabetical index.

E. L. Middleton

HARDY, Harriet L. **The Character and Distribution of Disease in American Industries using Beryllium Compounds.** *Proc. Roy. Soc. Med.* 1951, Mar., v. 44, No. 3, 257–62 (Sect. Epidem. & State Med. 1–6), 4 figs. [14 refs.]

The great increase in the use of beryllium compounds in the United States in the last 15 years has resulted in the appearance of variable syndromes acute, subacute and chronic.

The acute form follows intense exposure, and contact dermatitis, conjunctivitis and irritation of the [illegible]

fine nodularities, and the symptoms are loss of weight, dyspnoea and fatigue. The chronic form, also called delayed chemical pneumonitis, may develop *during or after exposure to low concentrations* of beryllium, and the onset may be delayed for periods [illegible]

men; hypercalcaemia and negative nitrogen balance have been noted. Death occurs in about 20 per cent. of cases; right heart failure, cerebral anoxia, inanition and cachexia are terminal episodes.

Acute beryllium pneumonia may be followed after a variable period by the chronic form without further exposure. At varying times in the course of the chronic disease the total serum protein and globulin, liver function studies, urinary calcium, serum calcium and phosphorus, electrophoretic pattern of serum, alkaline phosphatase and urinary steroids have been found abnormal. Liver biopsy *may show hepatic change where function tests are* normal. Certain tests are abnormal in both acute and chronic forms of the disease, suggesting different phases of a similar reaction. No malignant growths have as yet been reported in human beryllium poisoning.

The author suggests a hypothesis, based on the [illegible]

of exposure to beryllium, spectroscopic analysis reveals beryllium in the blood, urine and biological tissues. Tuberculosis and sarcoidosis must be ruled out. The histological appearances of the acute and chronic lung changes are distinctive. Acute beryllium pneumonitis has been attended by a low mortality since the seriousness of the process was recognized. In the chronic form drugs have been tried without

Number of known cases of Beryllium Poisoning

Process	Clinical designation	
	Acute	Chronic
Extraction of Be from ore	300+	11
Machining Be	10	4
Fluor. powder mfg.	7	3
Fluor. lamp mfg.	6+	110+
Fluor. sign tubing mfg.	—	15
Be alloy mfg.	—	10+
"Neighbourhood cases"	—	9
Fluor. lamp salvage	—	4
Research work	—	6+
Radio tube mfg.	—	6
Ceramics	—	3
Silica crystal mfg.	—	2
Mining and handling beryl ore	—	—

success; complete rest, support of morale, and intermittent administration of oxygen under pressure [illegible]

producing the disease.

The author's present view is that beryllium poisoning is a systemic disease rather than an exclusively pulmonary response. Apparently beryllium has a direct toxic effect on certain basic enzyme systems. It causes a diffuse cellular infiltration in

many tissues, which usually goes on to partial granulomatous formation and later irreversible fibrous replacement of functioning tissue, with resultant clinical illness, great disability in most cases, and frequently death. *E. L. Middleton*

STERNER, J. H. & EISENBUD, M. **Epidemiology of Beryllium Intoxication.** *Arch. Indust. Hyg. & Occupational Med.* Chicago. 1951, Aug., v. 4, No 2, 123–51, 2 charts. [Refs. in footnotes]

This exposition brings together information concerning all known cases of beryllium intoxication, [illegible] than 100 of pulmonary granulomatosis

[illegible] mitis, as

[illegible] ie stand-

[illegible] loes not

[illegible] Acute

[illegible] followed

inhalation of beryllium metal, beryllium oxide, the sulphate, the fluoride and the chloride, but not the dust of beryl, the ore of beryllium The acute disease has been produced in animals exposed to beryllium oxide The surface area of the oxide decreases with increase in the temperature at which it has been calcined, and only oxide prepared at low calcining temperatures causes acute pneumonitis [illegible] /cub m. caused

[illegible] in excess of

[illegible] um compounds

[illegible] more puzzles;

[illegible] d also persons

[illegible] e vicinity of a

[illegible]

length of exposure has long since been noted for other occupational poisons, such as tetryl, T.N.T. and lead.] In all chronic berylliosis, the oxide of beryllium seems to be the causative factor; and phosphors containing as little as 2 per cent. beryllium oxide have not caused trouble, while 12 per cent. is certainly toxic.

Chronic berylliosis has not been produced in animals. Disparity will occur between the magnitude of exposure and the incidence of berylliosis Quite low levels of exposure have caused severe and even fatal disease. Often a long latent period elapses between exposure and the onset of the disease. At autopsy the beryllium content of the lung may have no relation to the severity of the pathological effects. Beryllium oxide may also cause contact dermatitis, ulcers, subcutaneous granulomata, lesions of conjunctiva and cornea, and skin lesions, in patients with berylliosis.

A condensed table is presented [illegible]

a sensitizer. It can establish an allergic state, to which man and animals may respond differently Anomalies in the toxicity of beryllium are ascribed to the way in which sensitizing becomes active, even long after exposure, and results from unexpectedly [illegible]

antigen-antibody reaction, when granulomata may appear in the liver or skin, concurrently with the pulmonary symptoms. This concept is elaborated at length with clinical evidence called in support; and the point is made that the peculiar incidence of chronic berylliosis finds parallel in other well-recognized sensitization or allergic diseases *E. L. Collis*

VAN ORDSTRAND, H. S. **Current Concepts of Beryllium Poisoning.** *Ann Intern Med.* 1951, Dec., v 35, No. 6, 1203–17, 15 figs. [23 refs]

This paper is a summary of the main facts known about the toxicology of beryllium An account of the properties and uses of beryllium and its oxide is given, followed by descriptions of the diseases caused by them These are the various types of [illegible] the acute sensitization type

[illegible]

themselves on fluorescent lamps containing beryllium phosphor The lung lesions take the form of an acute pneumonitis with complete recovery in up to 4 months, or a chronic granulomatous infiltration, [illegible] for some years after exposure

[illegible]

in finely divided form have been found [illegible] type of lung disease, though in general the acute form results from the soluble compounds and the chronic from the less soluble

Tracer experiments with Be^7 have shown that beryllium in the body is stored in the bones. It has been found to inhibit alkaline phosphatase and it is thought that it may compete with magnesium, inhibiting enzymes activated by it. Intravenous

injections of beryllium compounds into rabbits have given rise to osteogenic sarcoma

The only form of treatment which has any effect on the chronic disease is with ACTH, which is suggested as the treatment of choice for the most severe cases *Peter H. Nash*

LIEBEN, J & JACKSON, A J **Beryllium Oxide Poisoning.** *Indust Med & Surgery* Chicago 1953, Nov, v 22, No 11, 507–9

The preparation of a beryllium copper alloy, containing some 4 per cent beryllium, was carried on from 1932 to 1946 (after which year it was suspended) by the Waterbury Branch of the American Brass Company The alloy was melted in a crucible-type

all the men had worked at the factory for a number of years in different departments. No one process or department could be definitely blamed Diagnosis was never simple; the patients came under notice with dyspnoea, asthma, doubtful pulmonary tuberculosis or silicosis, or cor pulmonale The finding of beryllium at autopsy in the lungs confirmed the diagnosis in several instances The industrial history of all the cases is stated

Curiously, no more than 3 other cases have been

STAV

Clinical details are given of 9 cases of chronic berylliosis (pulmonary granulomatosis) which occurred among women engaged in cathode coating

dried powder was a danger In other instances the exposure to beryllium resulted from folding the coated filaments, which caused chipping and cracking

dangerous unless precautions are taken.

Peter H. Nash

HARDY, Harriet L. **Epidemiology, Clinical Character, and Treatment of Beryllium Poisoning. Progress Report.** *Arch Indust Health*. Chicago. 1955, Apr, v 11, No 4, 273–9 [24 refs]

Information collected from all known sources is presented here relative to the toxicology of beryllium compounds The following compounds of beryllium

irreversible

No certain line of treatment has been discovered, but some remarkable cures have followed the exhibition of cortisone and corticotrophin But a favourable result does not always follow Recently the suggestion has been advanced that after cortisone and

E L Collis

SHILEN, J, KOPPENHAVER, F. B, CLELAND, J. G, LUTZ, L R. & VOUGHT, Virginia M. **Beryllium Extraction, Reduction, and Alloy Fabrication.** An Engineering Study covering Ten Years' Experience. *Indust Med. & Surgery* Chicago 1954, July, v. 23, No 7, 291–9

The authors of this paper present the results of air analysis and of medical examinations of workers in a factory where beryllium and many of its compounds have been handled in large quantities for some years

The highest reported atmospheric concentrations of

beryllium to which men without respirators are exposed are 1·30 mgm. per cubic metre at the primary

grind-

entra-

place

to place, and from time to time, make it impossible to estimate average exposures at the various processes

Samples of urine from 21 workers in various departments have been analysed for beryllium content. The concentrations varied from 5 43 down to 0 090 µgm. per litre in 24-hour specimens

Mass X-ray examinations were carried out in 1947, 1950, and then annually Of the 291 persons X-rayed in 1947 15 showed abnormalities and in the following years when all the employees attended, out of 277, 349, 395 and 424 persons X-rayed abnormalities numbered 7, 7, 9 and 10 respectively.

In addition to details of the X-ray findings, brief

ism due to illness.

It is unfortunately not possible to correlate the medical findings with the engineering studies or with the urinary excretion of beryllium.

In their summary, the authors say that "Cuts healed cleanly with no granulomatosis It is believed that the processing of beryllium can be done with the same degree of protection as that used in processing any other metal. While it is true that in some instances, particularly the most recent cases, beryllium poisoning has been suspected, this condition, as of January 1, 1954, has not been conclusively demonstrated" *R J Sherwood*

CHOLAK, J. & HUBBARD, D M **An Improved**

1 fig.

Spectrographic methods of high sensitivity have been devised for the determination of beryllium, which will detect as little as 0 0025 µgm. per ml. of a prepared solution But the sensitivity, accurate at 3 mgm, decreases in intensity up to 50 mgm, owing to variable quantities of salts precipitated in the solution with the beryllium The method has

using acetylacetone to isolate

method

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responds

troscope

curves

ryllium,

lacetone

following the

steps, is aluminium which does not interfere spectrographically. Anyone accustomed to the use of a spectroscope will find this improved method fairly simple. *E L. Collis*

WELFORD, G & HARLEY, J. **Fluorimetric Determination of Trace Amounts of Beryllium.** *Amer. Indust Hyg. Ass Quarterly.* 1952, Dec, v. 13, No. 4, 232–4.

The authors purify morin to provide a fluorescing

sodium hydroxide, and a portion is treated with 0·0001 per cent. purified morin (1 per cent. purified morin in acetone, diluted with distilled water).

The fluorescence is measured within one minute as fading occurs

A fluorimeter was designed having a linear range of 100, and a sensitivity of 0 005 µgm. of beryllium

Instruments Branch

can be used, but is not so sensitive as that specially designed

As calcium and magnesium were not completely separated chemically, the effect of their presence was investigated. Recovery of beryllium was not *affected when less than 14 mgm. of each was present* in the final solution. *R. J. Sherwood*

ELLENBURG, J. Y. & OWEN, L. E. **Spectrochemical Analysis of Beryllium in Biological Tissue.** *Arch Indust Hyg & Occupational Med* Chicago. 1953, June, v. 7, No. 6, 503–7, 2 figs. [10 refs.]

Because of the diagnostic value of determining the Be content of the lungs of berylliosis victims a study has been made to improve methods of preparing the sample and of subsequent analysis. In order to obtain a more

the content of Be

in the

in

ethanol

at-

free residue, after filtration, was combined

the

the filtered solvent

6 2 by ammonium acetate Germanium ions were

carrier and both the Be

ide

BeO

was

nt

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in

FELDMAN, I, HAVILL, Jean R & NEUMAN, W F **The State of Beryllium in Blood Plasma.** *Arch Biochemistry* 1953, Oct, v 46, No 2, 443–53 [20 refs]

"Dialysis studies of beryllium added to plasma, sera, and aqueous solutions show the transport of this ion to be determined principally by inorganic phosphate and citrate anions Significant interaction

VAN CLEAVE, C D, & KAYLOR, C. T **Distribution and Retention of Carrier-Free Radioberyllium in the Rat.** *Arch. Indust Hyg & Occupational Med* Chicago. 1953, May, v. 7, No 5, 367–75, 1 chart.

The authors have presented a detailed study of the distribution of beryllium as radio-active 7Be chloride, sulphate and citrate after intramuscular injection in the rat. The chloride and the sulphate were found mainly at the site of injection but the citrate was fairly rapidly distributed When the sulphate was injected into the blood system the liver and spleen

spleen and liver dropped, that of the skeleton (as measured by the femur) rose The authors state that colloids of large size are cleared rapidly from the blood and deposited in the liver and spleen, for example, beryllium sulphate. With decreasing size, particles disappear more slowly and are deposited in the bone-marrow and spleen

When beryllium is introduced into the blood stream in an already complex form, *e.g*, the citrate, it is rapidly excreted and deposited chiefly in bone

D. G Harvey

8 figs [Refs in footnotes.]

Disabling disease and fatalities have recently been ascribed to inhaling beryllium and its salts, the industrial use of which is undergoing a tremendous increase Animal experiments were performed to throw light on many obscure points, in which guinea-pigs, rabbits, rats, dogs and monkeys were made to inhale dust composed of 4 kinds of beryllium oxide. Two were refractory grades, with firing temperatures of 1,350 and 1,150°C.; one had a firing temperature of 400°C, and one was a fluorescent oxide used in the manufacture of fluorescent lamps, particularly blamed for causing berylliosis These dusts contained from 97 to 100 per cent beryllium oxide. The conditions under which the experiments were conducted are set out in considerable detail Only

caused in some animals weakness, emaciation and exertional dyspnoea, all of which passed off without leaving appreciable histological evidence of pulmonary damage Dust of low-fired beryllium oxide caused more definite anorexia, loss of weight and dyspnoea, progressive development of a macrocytic anaemia was found in the dogs used The production of acute toxic effects was correlated with the physico-chemical properties of the different grades of dust, particularly with the ultimate particle size and the state of aggregation The fluorescent and low-fired grade dusts were more toxic than the refractory grade dusts The fluorescent and low-fired dusts were ten times

dyspnoea, lowered arterial oxygen tension, and decrease in the albumin-globulin ratio in the blood serum, due to hyperglobinaemia and mild hypo-albuminaemia The inhaled beryllium dust was removed almost exclusively by phagocytosis from

few microgrammes per cubic metre, may cause serious injury *E. L. Collis*

Beryllium Fluoride at Exposure Concentrations of One and Ten Milligrams per Cubic Meter. *Arch. Indust Hyg & Occupational Med* Chicago 1953, Dec., v 8, No 6, 493–506. [Refs in footnotes.]

Toxic effects associated with compounds of beryllium would appear to be due to the beryllium itself rather

than to anions Experimental work with the sulphate and oxide has reproduced the effects in man. The experiments described here were designed to show the effects of beryllium fluoride mist on animals. In the course of two studies 251 animals were used. The first was exploratory and consisted in exposing animals to a concentration of 10 mgm./m^3 of beryllium fluoride mist for 63 exposure hours It was shown that beryllium fluoride is more acutely toxic than the sulphate or the oxide, but the picture of acute beryllium poisoning is the same

A second, definitive experiment was carried out, with a concentration of 1 mgm /m^3 of beryllium fluoride for 6 hours daily, 5 days a week Dogs exhibited anorexia, increased breathing effort and loss of weight Urinary uric acid increased in relation to urinary creatinine and is deemed a reliable indicator of dogs to beryllium. It is argued from this that beryllium may affect the pituitary and adrenal cortex functions, an observation which gives point to the known symptomatic relief of chronic poisoning in man when corticotrophin or cortisone is injected. Macrocytic anaemia appeared and was more pronounced with beryllium fluoride than with $BeSO_4$ mist or BeO dust Neither vitamin B12 nor Lextron, a liver-stomach concentrate fortified with ferrous iron, had any ameliorative effect on symptoms or blood changes

Lesions attributable to beryllium fluoride were confined to the lungs and were similar to those found in poisoning by the sulphate Two dogs exhibited varying degrees of consolidation, slight pulmonary oedema and some emphysema On microscopical examination the changes were found to be inflammatory Beryllium accumulated chiefly in the pulmonary lymph nodes and, to a less degree, in the lungs. Bone, especially the femoral epiphysis, contained the third largest amount per gramme of fresh tissue The amount of beryllium found in the marrow rarely exceeded 0·5 µgm per gramme of fresh tissue

The appearance of beryllium in the tissues is governed by solubility Only a very small fraction of inhaled beryllium oxide appeared in tissues other than the lungs and pulmonary lymph nodes On the other hand a much greater proportion of the soluble fluoride and sulphate appeared in the skeleton, liver, spleen and kidneys and, in the case of the fluoride, the beryllium deposited was greater than in the case of the sulphate The sulphate readily dissociates in aqueous solution and may permit the beryllium to interact with substances present in lung tissue to form insoluble compounds

H Wyers

MÜLLER, P. Beitrag zur experimentellen Berylliose **[A Contribution to the Study of Experimental Berylliosis]** Reprinted from *Schweiz Ztschr. f Allgemeine Path. u Bakt* 1952, v. 15, No 3, 354–77, 11 figs. [Numerous refs.]

Beryllium, because of its special properties including lightness, hardness, poor conductance and resistance to corrosion, is being used to an increasing extent in alloys, atomic physics, fluorescent lamps, ceramics, and even in a sea-water resistant textile made of fibres of beryllium alginate. Short reference to these uses is followed by some description and tabular records of published cases of poisoning by beryllium in man and some results of animal experiment. This introduces the present account of experiments in mice and rats devised to discover the effect of the peritoneal and intratracheal injection of suspensions of particles of the insoluble beryllium oxide of size 3 0 and 10 0 µ. The histological findings are described and illustrated by photographs. An early non-specific tissue reaction is produced and this changes slowly to a micronodular fibrosis. No evidence of toxic action on the tissue cells was observed

M. E. Delafield

OWEN, L. E., DELANEY, J. C. & NEFF, C. M **The Spectrochemical Analysis of Air-Borne Du[st] Beryllium.** *Amer. Indust. Hyg. Ass. Qu* 1951, Sept., v. 12, No. 3, 112–14, 3 figs.

POLEMANN, G. & JOHN, G. Über die Toxizität Berylliums und seiner Verbindungen **[Toxicity of Beryllium and its Compounds]** *Ze[itschr.] f Arbeitsmed. u Arbeitsschutz.* 1953, Nov., v. No 6, 168–73, 3 figs [41 refs]

CROSSMON, G. C. & VANDEMARK, W. C. **Microscopic Observations correlating Toxicity of Beryllium Oxide with Crystal Structure.** *Arch Indust Hyg & Occupational Med.* Chicago 1954, June, v 9, No 6, 481–7, 4 figs [11 refs]

Previous experiments with 4 different grades of beryllium oxide showed that they varied in toxicity [this *Bulletin*, 1951, v. 26, 61] Two refractory grades exhibited inappreciable toxicity, a fluorescent grade gave evidence of toxicity at comparatively high levels of 90 mgm /m^3, characterized by loss of weight in monkeys and cats; but a special grade showed toxicity which killed 30 per cent. of rats at levels of 90 mgm /m^3 The 4 grades were examined ph[ysi]sically to detect differences Spectrochemical analysis and X-ray diffraction failed to show them, but electron microscopy, particle-size, and specific-surface-area determinations revealed differences in particle size and state of aggregation The particle size of the fluorescent and special grades was 10 times smaller than the 2 refractory grades, and smallest of all in the most toxic special grade This special grade was also 25 times as soluble as the refractory grade

The methods used for examining the grades microscopically by the polarizing microscope, and the technique termed dispersion staining, are explained; they are borrowed from mineralogy. The fluorescent grade contained many particles similar to those in the refractory grades both in indices and in birefringence, but smaller and rod-shaped The special grade contained none of these particles, its particles had much lower indices and were generally single-refracting This lower index material with little or no birefringence was the most toxic.

E L. Collis

*p 255.

under careful control in order to protect the experimenters.

killed at different periods up to 582 days after exposures had ceased After only one hour the lungs were found to contain appreciable amounts of beryllium, which increased with the length of the exposure Elimination was slow and concentrations remained high to the end of 582 days Dust particles were found free in the alveoli or the bronchi, but most were in large mononuclear phagocytes or within the protoplasm of swollen septal cells Some fibrosis occurred in the areas around dust cells, but on the whole the tissue reactions to the dust were minimal in no way resembling the granulomatous inflamma-

COCHRAN, K. W, ZERWIC, Marcella M & DUBOIS, K. P. **Studies on the Mechanism of Acute Beryllium Poisoning.** *J. Pharm & Exper Therap.* 1951, July, v. 102, No 3, 165–78 [29 refs]

In order to throw light on the reactions of the body to beryllium, an investigation was made into the actions of beryllium on phosphatases Experiments were carried out *in vitro* and also *in vivo* Rats and guineapigs were used, as beryllium is highly toxic to rats, while guineapigs are about ten times as resistant The intraperitoneal LD_{50} for rats was found to be 4 4 mgm /kgm of beryllium chloride, while that for guineapigs was 56 mgm /kgm. Wide differences in alkaline phosphatase activity were found in various normal tissues of these animals, such activity was inhibited by beryllium Thus 5 mgm /kgm of beryllium killed rats in 8 days and produced nearly complete inhibition of serum alkaline phosphatase within 5 hours after poisoning. But the extent of the inhibition varied greatly with the dosage of beryllium and with the different organs, with the dosage of beryllium and with the species of animal Some other metals, in particular cobalt, nickel, zinc, yttrium and lanthanum, were found to exert an antagonistic ...

toxic action. The effects of beryllium on enzymes involved in phosphorus metabolism indicated that the phosphoglucomutase of liver and skeletal muscle is inhibited by beryllium *in vitro* and *in vivo* and that the inhibition of this enzyme by beryllium could be counteracted by magnesium *in vitro*. Adenosine triphosphatase activity was decreased in tissues

and adenosine triphosphate and an increase in inorganic phosphorus. The level of glucose-1-phosphate increased, while glucose-6-phosphate decreased.

E. L. Collis

Nine guineapigs were given intraperitoneal injections of beryllium sulphate in doses varying from 10 mgm to 150 mgm. per kgm. and were killed after periods of 24 to 72 hours The livers showed rounded foci of necrosis in the mid-zones of the lobules In places these were continuous, but the peripheral and central parts of the lobule were spared The suprarenals and spleens showed lesions similar to those produced by stress

Histochemical staining for alkaline phosphatase showed diminution of the enzyme in nuclei of suprarenal cells, convoluted tubules of kidney and intestinal

of metaphases

The authors summarize the findings as a toxic action on the liver, and non-specific stress reactions in the spleen and suprarenals A slowing of mitosis is produced by a prolongation of the metaphase.

Peter H. Nash

KLEMPERER, F W, MARTIN, A P & LIDDY, R. E. **The Fate of Beryllium Compounds in the Rat.** *Arch Biochemistry* 1952, Nov, v 41, No 1, 148–52

" Beryllium was injected intravenously into rats When administered as ionic solution or as citrate complex, nearly half of the injected quantity was excreted and most of the remaining beryllium was retained in the bones

" Colloidal beryllium was predominantly deposited in the liver

" When deposited in bone, beryllium was retained for long periods

"Colloidal beryllium which had been deposited in the liver was mobilized gradually Beryllium mobilized from the liver was partly excreted and partly transferred to bone"

VAN CLEAVE, C. D & KAYLOR, C T. **Distribution, Retention, and Elimination of Be^7 in the Rat after Intratracheal Injection.** *Arch Indust Health* Chicago 1955, May, v 11, No 5, 375–92, 8 charts & 24 figs on 2 pls

The technical difficulties encountered in administering dust clouds containing known and constant concentrations of Be to experimental animals led the authors to adopt the method of intratracheal injections of radio-active ^7Be Most of the ^7Be was in the form of $^7BeSO_4\,4H_2O$ in dilute sulphuric acid made isotonic with NaCl and adjusted to pH 4 5–50. Another form was ^7Be in 1 per cent citric acid also made isotonic with NaCl and adjusted to pH 5 0 Female rats were used and the intratracheal injections made under ether anaesthesia Groups of animals were sacrificed at intervals from 1 to 315 days following injection, and some analyses of urine and faeces were made as well as of lungs and other tissues

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STOKINGER, H E & STROUD, C A, with the technical assistance of R. E ROOT. **Anemia in Acute Experimental Beryllium Poisoning.** *J Lab & Clin Med* 1951, Aug, v. 38, No 2, 173–82, 2 figs

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[The results of these experiments show a strikingly mild action as compared with what is known of the occupational risks and accidents when this metal is used in industry] *J. Cauchi*

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The results indicated that there was wide variation in the distribution of Be in the lobes of the lungs examined and also in individual lobes Citrated ^7Be was almost completely mobilized from the lungs in 4 days, and 79 per cent of the dose was eliminated in the urine and faeces Some $^7BeSO_4$ preparations were mobilized rapidly after 16 days, while other preparations remained in the lungs in reasonable concentrations for periods up to 315 days Excretion from the kidney was rapid and high initially, but thereafter slowed down to low levels undetectable after 75 days Faecal ^7Be remained higher than ordinary ^7Be for 40 days *D G Harvey*

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The summary by the authors includes the following deductions —

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beryllium in soluble form, adjusted to physiological *p*H, was given intravenously The urine was collected from the catheterized bladder and was supplemented by repeated washings Blood samples were taken, in heparinized tubes, from the ear vein at intervals throughout this procedure, and centrifuged immediately. In several of the experiments an additional blood sample was taken early in the experiment for the purpose of determining the ultrafiltrability of the beryllium, with a centrifuge type of apparatus essentially similar to that used by FELDMAN *et al.* (*Anal. Chem*, 1950, v 22, 837), these authors had shown that the Cellophane membrane employed was permeable to small colloidal particles such as inulin, but was impermeable to beryllium hydroxide and protein Plasma and urine samples were counted with a Geiger-Muller counter equipped with a dipping tube Sufficient counts were taken to give a counting

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SPIEGL, C. J., LAFRANCE, L. & ASHWORTH, Betty J. **Blood and Urine Changes in Experimental Beryllium Poisoning.** *Arch. Indust. Hyg. & Occupational Med* Chicago. 1953, Apr., v. 7, No. 4, 319-25, 4 charts.

[illegible]

poisoned patients suffer from anoxia, it was decided to investigate the phospholipoid/cholesterol ratio in dogs exposed to the sulphate, oxide and fluoride of beryllium. It was found that the sulphate caused a decrease in the ratio. The possible systemic effect of the beryllium also suggested that some normal metabolites might be investigated and determination of the uric-acid/ creatinine ratio in the urine of dogs exposed to the fluoride showed that this was markedly increased with increasing exposure. *D. G. Harvey*

DENARDI, J M, VAN ORDSTRAND, H S & CURTIS, G H. **Berylliosis. Summary and Survey of all Clinical Types in Ten Year Period.** *Cleveland Clinic Quart* 1952, Oct., v 19, No 4, 171–93, 4 figs [19 refs]

Since 1940 the authors have observed and treated 461 cases of beryllium poisoning, the majority being acute respiratory and dermatological cases This paper reviews experience gained

Acute tracheo-bronchitis is described as a less serious condition than pneumonitis in which, although there is a reduction in vital capacity and râles may be heard in the chest, the X-ray appearances are [illegible]

conglomerate nodules [illegible] pneumonitis, 10 died *There was no instance of a* patient who had had acute pneumonitis developing *chronic* berylliosis After recovery beryllium can be found in measurable amounts in the urine for several years

Among 30 cases of chronic berylliosis (pulmonary [illegible]) there were 8 deaths Twelve of the [illegible]

[illegible] to be static or showing improvement and 15 per cent *to be* deteriorating

The acute eczematous type of dermatitis is thought to be due to allergy

Tentative standards for permissible concentrations of beryllium in the air have been adopted They are . 2 µgm. per cubic metre daily average, 25 µgm per cubic metre for transient concentrations and 0 01 µgm. per cubic metre monthly average in the neighbourhood of a plant

By careful preventive measures the incidence of skin lesions among workers in extraction plants has been reduced from 25 per cent. to 2 per cent, and that of respiratory illness to almost nothing

Peter H. Nash

POLI [illegible]

In this article the author considers various fundamental aspects of the physiological and pathological action of beryllium which underlie its effect in causing pulmonary disease The subject is divided under 5 heads. acute pulmonary berylliosis; the biological *action of beryllium on living tissues; chronic* pulmonary berylliosis; systemic poisoning by beryllium *compounds; and treatment of pulmonary* berylliosis with ACTH and cortisone

It is necessary to study the action of beryllium itself and of the various acid radicles with which it is combined At one stage in the metallurgy of beryllium the double fluoride with sodium enters, this is readily hydrolysable giving hydrofluoric acid which is highly irritant to exposed mucous membranes and, in the pulmonary alveoli, causes chemical pneumonia *The acute forms of berylliosis* described early in the industry were essentially *due to fluorine Certain acute or subacute cases* followed exposure to dust of beryllium oxide, theoretically free from fluorine; in fact, the oxide always contains some fluoride, sometimes up to 3–5 per cent which is enough to cause an acute reaction; [illegible] should not be attributed to the [illegible]

[illegible]loma, and the [illegible] these lesions, variously combined, determine [illegible] clinical *forms of the disease.* The development[illegible] and histological characters of the two types of *lesion,* and of transitional forms, are described and many points which are still unexplained are discussed

Beryllium is a systemic poison which causes irreparable damage to the liver and kidneys, a fact which may be lost sight of in view of the dominant [illegible] and remains immobilized For these reasons the amount of beryllium in the circulation is very small, and usually well below the limit of the excretory power of the liver and kidneys. The damage caused to these organs and to the haemopoietic system has been shown to be caused by the element beryllium and not by the acid radicles The effect of beryllium on the skeleton in causing rickets, by ingestion, and osteo-sarcoma in experimental animals, by intravenous injection, is discussed The study of the movement, localization and elimination of beryllium is outlined, with reference to the use of radio-active isotopes

Comments are made on the treatment of beryllium disease of the lungs with ACTH and cortisone, with special reference to the recent work in the United States The treatment of this little known disease [illegible] accumulated at the periphery of the granulomas, thus liberating a source of beryllium, this calls for experimental proof, but such a rapidly liberated source of the poison might endanger the excretory power of the liver and kidneys, and this danger should be realized when elimination is being induced In the treatment of beryllium disease of the lungs it is essential to maintain the respiratory function, ventilation and circulation, and to avoid the dangers of general poisoning *E L Middleton*

DeNardi, J. M, van Ordstrand, H S, Curtis, G H & Zielinski, J **Berylliosis. Summary and Survey of all Clinical Types observed in a Twelve-Year Period.** *Arch Indust Hyg & Occupational Med* Chicago 1953, July, v 8, No. 1, 1-24, 6 figs [Refs in footnotes]

A series of 468 cases of various types of beryllium [illegible] respiratory tract involvement, of the chronic cases 2 were dermal and 35 pulmonary As a result of medical supervision and improved engineering, a remarkable reduction in morbidity and mortality was achieved

Most of the reported cases were traced to mechanical breakdowns, personal failures and experimental procedures Dust concentration in the working environment was limited to 2 µgm. per cubic metre, transient concentrations to 25 µgm. per cubic metre and that in the vicinity of any plant to 0 01 µgm. per cubic metre as a maximum monthly average. Pre-employment medical screening, annual examinations and biennial radiological investigations, together with a programme of health and safety education, formed the medical approach.

Treatment of skin cases consisted in removal from contact, local soothing and antihistaminic ointments. Beryllium ulcer, generally occurring in the course of the dermatitis and due to the implantation of crystals in a wound, was treated by curettage Chronic beryllium granuloma, a subcutaneous nodule occurring 1 to 4 months after the implantation of beryllium phosphor into a wound, was treated by débridement and wide [illegible] pital for complete bed rest, oxygen, antibiotics, antihistaminics, digitalis, cortisone and corticotrophin The mortality was 10·7 per cent. Chronic berylliosis, characterized pathologically by the presence of granulomata in the lungs and clinically by pulmonary insufficiency, was treated by restriction of physical activity, antihistaminics, antibiotics, digi[illegible] 50 per [illegible] regres[illegible] urine is evidence of exposure and not of disease The beryllium ion may be the sensitizing allergen in both the dermal and the pulmonary syndromes Beryllium is probably deposited in the greatest quantity in the reticulo-endothelial tissue of the lungs from which Be ions can be released to form a Be-protein complex. [illegible]

[If the allergic theory of the nature of berylliosis is accepted, the consequences so far as diagnosis is concerned are important, but are not so obvious in treatment So many conditions in which histamine release has been a prominent feature have failed to respond to antihistaminics that this approach to the treatment of berylliosis should be regarded with caution On the other hand, the danger of administering an antihistaminic needlessly is insignificant and not to be compared with irresponsible lung biopsy.] *H. Wyers*

Tara, S Quelle est l'évolution des pneumoconioses au béryllium ? **[What is the Course of Pneumoconiosis Caused by Beryllium ?]** *Arch Malad Professionnelles* Paris 1950, v 11, No. 2, 208-10, 2 figs

One instance of chronic berylliosis has been reported in French literature, the author now gives further

observations of the progress of the case It concerns a woman employed from February, 1943, to April, 1947, for 3 hours a day in sifting a powder consisting of silica, oxide of zinc, and beryllium No effort was made to control any dust, which was not considered dangerous At the end of 1946, progressive asthenia and dyspnoea on exertion appeared, at this time she was pregnant and had a baby in May, 1947, after which she did not fully recover An X-ray in February, 1948, showed micro-nodular shadows over both lungs associated with an unsatisfactory general condition A year later an X-ray showed macro-nodular shadows invading the whole of both pulmonary fields Both these X-rays are reproduced The general state of the patient has since deteriorated and she has lost weight. The case is held to be one of chronic berylliosis Twenty-six per cent of affected persons are held to die of cardiac insufficiency in less than 2 years, over 50 per cent become chronic invalids, and in the remainder improvement is in the clinical condition rather than in the X-ray appearances Prognosis must always be guarded Attention is drawn to the selective action of the changes attacking the reticulo-endothelial pulmonary tissues, even after experimental intravenous injections; but no clinical evidence is forthcoming of accidental cutaneous lesions being followed by pulmonary granulomata

E L. Collis

GOLDWATER, M L J La béryliose chronique [**Chronic Berylliosis**] *Arch Malad. Professionnelles* Paris 1951, v 12, No 1, 35–6, 4 figs on 2 pls.

This short note states clearly the work done in U S A. on the subject of berylliosis Then, in order to reinforce the conclusions drawn, three cases which have occurred in France are reported The first is that of a man who was employed for 5 weeks at a factory where beryllium and its salts were prepared from the mineral beryl, with considerable generation of dust He then served in the Army for six years, and then began to lose weight, develop a cough and become dyspnoeic An X-ray showed reticulation, and 0 14 mgm of beryllium was found

exhibited definite reticulation The third case was that of a girl aged 7 who lived within ¾ mile of the factory all her life She rather suddenly became dyspnoeic, weak and cyanosed, with tachycardia and cough No signs of tuberculosis were found Pneumothorax occurred and she died Granulomatosis was found in the lungs and pulmonary lymph-glands and

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E L. Collis

TARA, M S & DELPLACE, Y L'évolution d'une pneumoconíose au béryllium [**The Progress of a Case of Pneumoconiosis due to Beryllium**] *Arch Malad Professionnelles* Paris 1951, v 12, No 1, 37–40, 3 figs

The case of a woman came under observation in February, 1949, with definite pneumoconiosis, an X-

months later the X-ray appearance had greatly changed, the shadows now showing dense nodulation throughout both lungs At the same time there was pronounced dyspnoea even at rest, and the patient was seriously ill. Nevertheless the heart, even to

occur after exposure to the inhalation of heavy concentrations of silica and such did not take place in this instance Hence, the authors considered, after the second X-ray, that the condition should be

E. L. Collis

VAN BEEK, C & HAEX, A. J. C Een geval van chronische

middel de

Chronic

Geneesk.

The English summary appended to the paper

are not specific Pathologically anatomical examination reveals granulomatosis of the organs A description is given of a case in which the diagnosis was made on the basis of the history, thoracic X-rays and liver biopsy findings "

SNEDDON, I. B **Berylliosis: a Case Report.** *Brit Med J* 1955, June 18, 1448–50, 2 figs [11 refs]

Not many cases of berylliosis have been reported in Great Britain The one here described was in a woman aged 25 who had worked 3½ years at a rotary shearing machine trimming metal strip containing 2 per cent beryllium-copper alloy Although the shearing blade of the machine revolved slowly, fragments were thrown off with jagged edges which caused cuts and scratches on the hands, forearms and legs

She came under notice with numerous linear granu-

solutions of beryllium sulphate and beryllium nitrate gave in 48 hours a strongly positive eczematous reaction. During the height of the skin reactions, the lung lesions became temporarily more active After a full consideration of the causation of the lesions seen, the case was held to fulfil all the criteria for a diagnosis of systemic berylliosis *E L Collis*

Dutra, F R. **Experimental Beryllium Granulomas of the Skin.** *Arch Indust Hyg. & Occupational Med* Chicago 1951, Jan, v. 3, No 1, 81–9, 5 figs

The capacity of beryllium and its compounds to set up granulomata of the skin was studied on pigs, chosen because the porcine dermis has much in common with that of man Incisions were made in the skin, through which samples of five dusts containing different forms of beryllium were inserted After insertion the incisions healed simply, thereafter they were examined at intervals from 2 days up to 6 months Reactions were found in the subcutaneous fat, chiefly immediately beneath the dermis First proliferation of fibroblasts and activity of mononuclear phagocytes were noted, the reaction within 5 days being that of chronic inflammation Later, foreign body giant cells and granulomatous inflammation were seen, the cells containing ingested particles of dust. After a period of several months, granulomatous masses were formed The reactions

particle size 1·2 microns, a third was a phosphor of equal parts zinc oxide, beryllium oxide, and silica, the beryllium oxide of which had been calcined for 3 hours at 1,200°C., and then the mixture was calcined for six hours at 1,230°C, with particle size 1 5 microns, a fourth was a similar phosphor calcined for 3 hours at 1,285°C., and then for 6 hours at 1,260°C., with particle size of 3 microns, and a fifth was fragments of metallic beryllium, varying in size up to 0 01 mm. in diameter The granulomatous reactions were least with the dust of metallic beryllium and with the powders which had been calcined most The granulomata resembled the changes seen in human lungs after exposure to the inhalation of beryllium dusts.

E L. Collis

Robbins, J J. & Lyons, W. F. **Beryllium Granulomatosis: Report of a Case showing Response to Cortisone.** *Ann Intern. Med.* 1953, Jan, v 38, No 1, 120–24, 4 figs

A woman who had been employed for more than a year in 1943–4 at a beryllium factory developed berylliosis as indicated by clinical symptoms and X-ray appearances By November 1951 she was an emaciated, chronically ill young woman with severe

mgm. daily was first reached, dramatic improvement was noted By the fifth day cough and dyspnoea had almost completely disappeared, and oxygen and sedation were discontinued Temperature returned from 101° to normal Vital capacity rose from 300 cc to 1,000 cc The dosage of cortisone was gradually reduced to 50 mgm every other day without harmful effect The supply then failed and all the previous bad symptoms returned As soon as cortisone was again available, the same dramatic response was obtained The patient is now maintained on 25 mgm cortisone by mouth daily Chest X-ray appearances,

Roche, L, Tolot, F & Pommier, A Contribution à l'étude des pneumopathies aiguës par le béryllium et à leur traitement par la cortisone **[Observations on Cases of Acute Beryllium Pneumonitis treated with Cortisone]** *Arch Malad Professionnelles* Paris 1951, v. 12, No 6, 634–40, 5 figs

A factory making fluorescent powders containing beryllium has operated for several years with no evidence of occupational disease Alterations in the process, causing increased dustiness, were then made

Sections of lung tissue (examined by Professor Policard) showed typical lesions. In the other 2 instances, that of a chemical engineer aged 30 and a labourer aged 20, the disease occurred after 2 and 3 months' exposure respectively Both showed symptoms, signs and radiographic changes suggestive of acute beryllium pneumonitis and were severely ill. Cortisone, 100 mgm a day, was given for 4 to 6 weeks and resulted in rapid clinical improvement and clearing of the abnormal chest X-rays Both remained well and re-examination two and three months later showed no abnormalities

Peter H. Nash

ARCH. INDUST. HYG. & OCCUPATIONAL MED. Chicago 1951, June, v. 3, No. 6, 543–630, numerous figs [Numerous refs] **Symposium on the Treatment of Chronic Beryllium Poisoning with ACTH and Cortisone** [16 papers with Discussions].

J. M. de NARDI in the first communication tells of two women with severe symptoms of chronic pulmonary granulomatosis who, on becoming pregnant, displayed definite clinical improvement. The suggestion is advanced that the hormonal changes associated with pregnancy may have been responsible for the improvement. Next he tells of two patients, a man and a woman, suffering from advanced pulmonary granulomatosis, ascribed in the man to industrial exposure to beryllium, and in the woman to living in the neighbourhood of a beryllium factory. The man had acute bronchitis when exposed to beryllium while at work, which he gave up; four years later he was severely emaciated and depressed, with dyspnoea even at rest X-ray revealed a diffuse granular involvement of both lung fields. ACTH therapy was given in hospital, after 3 weeks, depression was less, dyspnoea and paroxysms of cough were reduced, weight and vital capacity had improved. The woman exhibited a similar clinical picture with similar granular and nodular involvement of both lungs on X-ray There were signs of right-side heart failure with dyspnoea and cyanosis No clinical response followed 4 gm. of cortisone acetate given over 14 days, then ACTH was tried 3 gm. over 2 months, with a daily maintenance dose of 20 mgm. Gradual improvement occurred, dyspnoea and [illegible]

The next case is reported by R J HASTERLIK A physicist studying neutrons and neutron sources was exposed to powdered beryllium and beryllium oxide bricks Seven years later he began to manifest the usual signs of pulmonary granulomatosis with X-ray shadows The condition progressed, and, after 9 years, treatment in hospital was commenced with pituitary adrenocorticotropic hormone At first 100 mgm. ACTH were given in 4 doses at intervals of 6 hours. In 4 days improvement was recorded, and the daily dosage was reduced to 70 mgm. The appetite became ravenous He [illegible]

[illegible] day in 4 divided doses, but X-ray [illegible] unaltered.

Five cases of berylliosis due to exposure in the manufacture of fluorescent lamps are described at length by E. M KLINE, S R INKLEY and W. H. PRITCHARD All displayed the usual symptoms of fatigue, loss of weight, cough and dyspnoea The X-ray findings of the cases are illustrated. When corticotropin [ACTH] and cortisone were administered prompt and substantial remission of symptoms [illegible]

[illegible] improvement was dependent on continuous therapy.

O A. SANDER tells of 5 persons with pulmonary disease ascribed to the phosphor zinc beryllium silicate used for coating neon tubes One man with [illegible]

[illegible] cortisone therapy gave no definite benefit. The fourth was a woman stenographer at the factory with typical symptoms and clinical findings; after 5 weeks of ACTH and cortisone striking improvement occurred; fatigue and dyspnoea lessened, cyanosis disappeared and a rapid erythrocyte sedimentation rate became normal The fifth was a woman who had done tube filling and became stricken with berylliosis so that she was quite bed-ridden; then she only just escaped death from lobar pneumonia; slowly she recovered without cortisone or ACTH, with remission of both clinical signs and X-ray [illegible]

[illegible] hazard

Another patient exposed to dust from fluorescent lamps showed signs ascribed by J. W. CASS to berylliosis, with all the symptoms of that disease After observation in hospital he was discharged completely disabled and still acutely ill with dyspnoea and debility He had an episode of unexplained diarrhoea, and a series of nasal haemorrhages calling for transfusions Then, without further therapy, he recovered to normal life with remission of the X-ray appearances in the lungs

G. K. FENN tells of a works-chemist with exposure for 5 years to *beryllium phosphors* He developed chest trouble which advanced steadily; the case is described at length Cortisone and ACTH were both used with temporary and doubtful benefit. The case *ended fatally, a diagnosis being* made of "acute pulmonary decompensation due to pulmonary fibrosis due to chronic pulmonary inhalation disease due to inhalation of beryllium", with "cor pulmonale" and adrenal atrophy.

The patient spoken of by P W. REYNOLDS was only exposed for some 2 hours smoothing off the surface of beryllium oxide beads used for television insulators; others more exposed did not suffer. Five months later she developed symptoms ascribed to berylliosis with chronic granulomatosis of both

lungs The condition became pronounced. ACTH was given, but side effects developed Later cortisone therapy was given, 100 to 300 mgm per day intramuscularly Cyanosis, clubbing of the fingers and dyspnoea improved and oxygen was no longer needed; her menses, which had been in abeyance, returned Cortisone is still being given, 150 to 200 mgm daily by mouth

Another single case is described by Harriet L. HARDY, F. C BARTTER and A. J JAFFIN A woman was employed for two weeks with exposure to dust of beryllium phosphor Six years later she became pregnant, and her lungs were found to present granular changes characteristic of berylliosis After confinement she became weak and dyspnoeic, biopsy of the liver showed unusual hepatitis Beryllium was found in the liver and urine She was taken into hospital extremely weak and dyspnoeic, having episodes of spontaneous pneumothorax ACTH therapy was instituted and carefully observed A dramatic improvement ensued, she could do without oxygen and take more exercise, while X-ray showed regression of densities But episodes of spontaneous pneumothorax continue

A discussion of choice of drugs and dosage between ACTH and cortisone was opened by H S Van ORDSTRAND ACTH, the adrenocorticotropic hormone, is of pituitary origin, it is a protein and not a steroid; it stimulates the adrenal cortex for the output of cortisone and other steroids It may overstimulate the adrenal cortex, and adrenal cortical insufficiency may ensue on its cessation Cortisone and like steroids depress the pituitary mechanism with resultant similar adrenal insufficiency The [illegible]

the dose of cortisone should be 4 times that of ACTH, of which 60 mgm. every 6 hours has been used Some say that thyroid extract enhances the therapy, and others that insulin increases its effect. Each subsequent speaker put forward a different opinion

A clear and useful exposition is given by T F FRAWLEY of the multiple and profound physiological changes produced in the body by adrenal cortical steroids; these changes are cytological, hormonal, enzymatic, metabolic, neuromuscular and electrolytic This exposition includes cortisone therapy for berylliosis The changes are the body's normal response to stress, and danger may arise if these normal reactions are stimulated too far by either drug [illegible]

Six cases reported by J McCLEMENT had diffuse pulmonary disease, only one of which was ascribed to beryllium; all were given cortisone and ACTH therapy. The beryllium case did not benefit. One improved dramatically; the others varied in their responses Pulmonary granulomatosis interferes with the diffusion of oxygen in the lungs This capacity is helped by the therapy.

An extended study is presented at length by B. G. FERRIS, J E AFFELDT, H A KRIETE and J. L [illegible]

ference The findings are presented in graphic and tabular forms

Another case of pulmonary granulomatosis definitely ascribed to exposure to beryllium is described by G W WRIGHT The patient received cortisone [illegible]

ventilation equivalent

F KLEMPERER discusses current research problems [illegible]

and that it does not seem to be excreted from the body on administering cortisone It is not known how berylliosis occurs and how the adrenal steroids [illegible]

poisoning.

E. L. Collis

KENNEDY, B. J., PARE, J. A P., PUMP, K. K., BECK, J C., JOHNSON, L. G., EPSTEIN, N. B., VENNING, E H & BROWNE, J. S L. **Effect of Adrenocorticotropic Hormone (ACTH) on Beryllium Granulomatosis and Silicosis.** *Amer. J. Med* 1951, Feb, v. 10, No 2, 134–55, 20 figs. [53 refs.]

"1 Adrenocorticotropic hormone (ACTH) was administered to two patients with chronic beryllium granulomatosis Temporary, subjective and objective

improvement occurred as judged by respiratory function studies and x-rays.

"2. Improvement was demonstrated in one patient with silicosis on administration of ACTH

"3 Metabolic observations of the effects of adrenocorticotropic hormone in these patients are presented"

WHITE, M R, FINKEL, A J & SCHUBERT, J **Effect of Adrenocorticotrophic Hormone on Tissue Distribution and Acute Toxicity of Beryllium.** *Proc. Soc Exper Biol & Med.* 1952, Aug-Sept, v 80, No 4, 603–4 [11 refs]

"Adrenocorticotrophic hormone (ACTH) had no appreciable effect on the distribution or retention of radioberyllium, injected into mice with and without carrier beryllium sulfate The survival of mice acutely poisoned with beryllium sulfate was not influenced by ACTH"

FINKEL, A J. & WHITE, M R **Salicylates and Experimental Beryllium Poisoning.** *Proc Soc. Exper. Biol & Med* 1952, Apr., v 79, No 4, 672–3

[illegible] tonally administered [illegible]

tration of intravenous beryllium sulfate in LD_{95} amounts Salicylate analogues without the ortho-hydroxy, carboxylic acid grouping were generally ineffective as were 2 dihydroxybenzoates."

SCHUBERT, J. & WHITE, Marcia R **Effect of Citrate Salts and Other Chemical Factors on the Distribution and Excretion of Beryllium.** *J Lab. & Clin. Med* 1950, June, v 35, No. 6, 854–64, 3 figs. [20 refs]

"Following intraperitoneal injection of Be^7Cl_2 into rats, urinary excretion of Be^7 was about 13 6 per cent of the injected dose during the first twenty-four hours and subsequently fell to about 0 5 per cent each day. After intraperitoneal injection of Be^7 as the citrate complex, however, 40 per cent of the dose was found in the first day's urine The femur contained twice as much Be^7, while the liver, other viscera, and probably the muscle contained much less Be^7 than after Be^7 chloride injection.

"Sodium or zirconium citrate injected intraperitoneally two hours after the injection of the Be^7Cl_2 increased the urinary excretion of Be^7 from 13 6 per cent to 32 and 36 per cent respectively during the next twenty-four hours. After sodium citrate administration the Be^7 content of the liver, spleen, and kidney was reduced significantly, while after zirconium citrate administration the skeletal content was lower. Neither citrate given six days later affected Be^7 metabolism. Calcium gluconate or the citrates of Na, Al, Zr, and Th given to the Be^7 citrate-injected rats had no effect on the distribution or excretion of Be.

"The distribution of Be^7 injected as the chloride differed markedly with the route of administration. After intraperitoneal injection into rats the pancreas contained 15 per cent of the dose After intravenous injection there was no Be^7 in the pancreas, but much more in the skeleton, liver, and spleen.

"Two months after intravenous injection of Be^7 citrate the urinary excretion of Be^7 by an adult dog was about 0 05 per cent of the injected dose per day, the fecal excretion about 0 005 per cent. Administration of the citrates of Na, Zr, or Al twenty-seven or more days after Be injection did not affect Be^7 excretion. Most of retained Be^7 was in the skeleton, particularly the long bones, 128 days after injection.

"The results obtained were interpreted by a consideration of the chemical and colloidal properties of beryllium.

"The production of beryllium-induced granulomas and possibilities for their treatment are discussed"

WHITE, Marcia R, FINKEL, A J. & SCHUBERT, J **Protection against Experimental Beryllium Poisoning by Aurin Tricarboxylic Acid.** *J. Pharmacol. & Exper Therap.* 1951, June, v. 102, No. 2, 88–93, 1 fig

Recent evidence [Schubert and White, above] suggested that the toxicity of beryllium salts was due to the beryllium ion and that beryllium poisoning might be tr[illegible] beryllium [illegible] by the use [illegible] beryllium ic[illegible] lake ALDRIDGE, BARNES and DENZ [this *Bulletin*, 1950, v 25, 929] have demonstrated that the dye* naphthochrome green B, Schultz No 851, forms a [illegible] in the tissues

[illegible]

and so reduce the amount of beryllium available in this form to induce damage to the liver and other susceptible tissues The protective effects observed in these experiments are taken as indirect [illegible] of the hypothesis

[illegible] water- [illegible] ryllium [illegible] d to be [illegible] in the [illegible]

*v. II, 234

experiments described. The authors found that mice given 0 7 mgm. Be per kgm as beryllium sulphate by intravenous injection showed an increased survival rate when the ammonium salt of aurin tricarboxylic acid was administered intravenously in doses from 1 to 4 mgm. per mouse given from one hour before to at least 8 hours after the injection of beryllium sulphate "Rats acutely poisoned with Be were ... [illegible]

[illegible]

acute and chronic berylliosis in man. While this paper is of interest to the experimental pathologist, it would appear to have little practical application to the problems of beryllium poisoning in man]

P Lesley Bidstrup

LINDENBAUM, A , WHITE, MARCIA R & SCHUBERT, J. **Studies on the Mechanism of Protection by Aurintricarboxylic Acid in Beryllium Poisoning. III. Correlation of Molecular Structure with Reversal of Biologic Effects of Beryllium.** *Arch Biochemistry* 1954, Sept , v 52, No 1, 110-32. [18 refs]

"More than seventy different substances have been tested to ascertain the relations between the number, kind, and position of functional groups, and the ability of [illegible] effects [illegible] phatas [illegible] comp[illegible] inhibition of the enzyme also lacked antidotal activity On the other hand, a compound that reversed the enzymatic inhibition did not necessarily protect mice from Be poisoning

"The effectiveness of a molecule in reversing the biologic effects of Be is dependent upon a number of chemical and biologic factors, including the ability to form a stable five- or six-membered chelate ring with Be, molecular size, presence of hydrophilic groups, proton affinity of chelating groups, metabolism, and toxicity "

WHITE, MARCIA R. & SCHUBERT, J **Studies on the Mechanism of Protection by Aurintricarboxylic Acid in Beryllium Poisoning. IV. Comparative Effects of Related Compounds on Survival of Be-Poisoned Animals and on Distribution of Be.** *Arch. Biochemistry* 1954, Sept., v 52, No 1, 133-42. [14 refs.]

"The ability of an injection of either sulfosalicylic acid or gentisic acid, given 1 hr before or after beryllium, to prevent death of mice injected with the LD_{99} of $BeSO_4$ is lost when these compounds are injected 4 hr after or 2 hr before the Be Salicylic acid loses its effectiveness when given about 8 hr before or after Be. Aurintricarboxylic acid (ATA) loses effectiveness when given between 10 and 16 hr after Be and gradually loses protective ability when given more than 1 day before Be

"When small, partially effective doses were compared on a molar basis, ATA was much more effective in protecting Be-poisoned mice than either salicylic acid or sulfosalicylic acid ATA was equally effective injected 5 min or 1 hr after the Be, while small doses of salicylic acid and especially of sulfosalicylic acid were less effective given at 1 hr

"In comparison to ATA, which has been shown to have no effect on the distribution of Be that might explain its therapeutic effect in Be-poisoned mice, salicylic and sulfosalicylic acids injected 1 hr. after radioberyllium caused a marked increase in Be^7 excretion and a reduction in the over-all retention of Be^7 Since sulfosalicylic acid given 4 hr. after the Be still causes this increase in excretion but does not prevent the death of the mice, the increase in Be excretion is not thought to be responsible for protecting the animals treated at 1 hr

"Inactivation of Be by chelation *in situ* in critical tissues appears to be the important factor in preventing death of mice acutely poisoned with Be "

LINDENBAUM, A , SCHUBERT, J & WHITE, MARCIA R. **Studies on the Mechanism of Protection by Aurintricarboxylic Acid in Beryllium Poisoning. V. Long-Term Distribution Studies with C^{14}-Labeled ATA.** *Arch. Biochemistry* 1954, Sept., v 52, No 1, 143-7, 2 figs

"1 The distribution of a single injection of C^{14}-methyl-labeled aurintricarboxylic acid (ATA) in tissues was determined over a period of 8 months in rats, and after 24 hr in dogs

"2 The levels of ATA retained in all rat tissues studied 24 hr after administration were retained for as long as 1-3 months The highest concentrations were found in kidney, spleen, and liver There were measurable amounts in all tissues for as long as 8 months

"3 ATA appeared to be uniformly distributed in soft tissues, presumably as a protein-ATA complex, and was not detected in inorganic bone "

LISCO H & WHITE, MARCIA R **The Modification of Beryllium-Induced Tissue Damage in Mice by Therapy with Aurintricarboxylic Acid.** *Brit J. Exper Path* 1955, Feb , v 36, No 1, 27-34, 4 figs on pl

The experiments were performed on 3 groups of adult female mice (1) Be only, each animal was given a single LD98/3-days dose of $BeSO_4$ intravenously, this was equivalent to 17 μgm. Be per mouse (2) Be as in (1) followed 1 hour later by 4 mgm [illegible] venously. [illegible] at 12, 24, [illegible] and the tissues were examined histologically.

miners (34) working 3 seams of fluorspar (calcium fluoride) and some 31 miners working another seam were examined clinically and by X-ray. The 34 miners were examined in 1948, 1949, 1950 and some

or any tendency to tuberculosis] The underground work for both groups of miners was similar, the ore-bearing veins were attacked with picks and pneumatic drills, after which the minerals were brought down by explosives and removed from the mines Half to three-quarters of an hour elapsed to allow the dust to subside after the shots were fired, before the workings were entered The one decided difference lay in the composition of the minerals; in the first mines the fluorspar contained about 60 per cent. free silica; in the second mine the fluorspar was much purer and amounted to 97 to 99 per cent The exposure to dust was at a concentration of 500 particles per litre of air, and the particles were fine, from 0 5 to 0 1 μ Apparently the pneumoconiosis due to fluorspar alone is slight. *E L. Collis*

POLICARD, A. & COLLET, A Recherches expérimentales sur la nocivité des poussières de spath fluor (fluorine) **[Experimental Research into the Toxicity of Dust of Fluor Spar]** *Arch Malad Professionnelles* Paris. 1953, v. 14, No. 2, 117–22, 4 figs

Dust from fluor spar has been recognized as causing acute silicosis; but fluor spar occurs as veins in a matrix of quartz, so the harm might be due to the quartz Nevertheless, the ion of fluorine is known to be toxic. In the research now reported, dust, with most of its particles less than 5 μ in size, was prepared by crushing (a) natural fluor spar with less

different amounts of calcium fluoride and pure quartz These various dusts were suspended in physiological saline solution and injected peritoneally Their toxicity was measured by their capacity to set up a fibrotic reaction, estimated by the appearance in 1 or 2 months of more or less fibrous miliary nodules on the epiploon The reaction of the lymphatic glands was also noted.

silicon, in 1 or 2 months can set up a more intense fibrosis than quartz, i e, that the toxicity of fluor spar is at least as important as that of quartz At the same time the reactions in the lymphatic glands were much less than the reactions due to quartz, and rather different, being less fibrotic. The possible chemical changes in these reactions are discussed, without any certain conclusions. *E. L Collis*

VACCAREZZA, Rodolfo A. Higiene y salubridad en la industria del cemento portland. Su investigación en las fábricas Argentinas **[Hygiene and Health in the Portland Cement Industry. Investigation in the Argentine Factories]** 656 pp 1950: Buenos Aires · Guillermo Kraft Ltda

This is a report of an investigation made at the request of the *Asociación de Fabricantes de Cemento Portland* with the object of determining the conditions provided to safeguard the health of workers in the cement industry in each of the establishments which *formed part of the Association. The work was planned* in 3 groups of enquiries at 11 factories included in the investigation: (1) the situation, structure and layout of the factory, raw materials used, methods of manufacture, numbers employed and conditions of work; (2) the hygienic conditions of the workplaces, especially with regard to the physical conditions of the atmosphere, as temperature, humidity, cooling power and air movement, and the concentration and size-frequency of dust particles in the atmosphere, and the illumination of places of work; (3) clinical and radiological examinations of the workers Of the 11 establishments 4 were in the Province of Buenos Aires, 2 in each of the Provinces of Córdoba and Mendoza and one in each of the Provinces of Entre

sampled at a total of 860 sampling positions and 15,480 determinations were made The total number of workers was 3,394, of these 2,834 were given clinical and radiological examinations, 149 were examined only clinically and 407 only radiologically The author

size determinations at ranges of 1–5, 5–10, 10–25 and 25–30 microns. Illumination was measured by an indirect method using photo-electric cells determining direct and reflected or diffused light The medical examinations included personal history and employment in the occupations in the cement industry; the

general state of health and physique and special examinations of the eyes, ears, nose, skin and cardiovascular system, and clinical and radiological examinations of the chest

The second part of the report contains the conclusions, preceded by a review of the literature on similar investigations, chiefly in the United States, and with special reference to the composition, particle-size and concentration of dust and their significance in the causation of pneumoconiosis The concentra- [illegible]

[illegible]

and grinding of the clinker and bagging the finished cement. In the raw materials classes in 3 factories with the highest mean concentrations of dust the [illegible]

[illegible]

materials classes were about 0 369, 0 752 and 0 833 million, and in the manufactured material class the lowest counts were 0 675 and two counts slightly under 4 million particles. It is pointed out by way of comparison that the average concentrations of dust particles found in cement factories in the United States, by the U.S. Public Health Service, reached 25 million particles per cubic foot, under similar conditions the concentrations found in the cement works of Argentina were about 5 7 millions per cubic foot.

Comparative tables are given setting out the findings of the medical investigations in each of the 11 factories. On the general state of physique and nutrition of the workers it was found that 32 per cent were of normal weight 28 [illegible]

[illegible]

Examinations of the ear showed plugs of wax in 494 workers, thickening of the tympanum in 174, suppurative otitis in 4 of 258 workers at one factory, and otolithiasis in one worker at each of 2 factories Examinations of the skin showed irritative dermatitis in 92 and callosities of the palms in 406 Examinations of the nose are reported very fully. The cement dust in the atmosphere, consisting of 50 97 per cent, of particles under 5 microns, most of these 1-2 microns, was hygroscopic and, in contact with the mucous membranes of the air passages, caused at first acute or subacute rhinitis and later chronic hypertrophic and atrophic rhinitis, rhinolithiasis (a stony incrustation on the nasal mucosa) simple retraction, and perforation of the nasal septum A very significant correspondence was found between the incidence of chronic rhinitis and the average concentration of dust particles in the atmosphere of the workplaces; other factors, however, such as the quality of the dust, humidity, period of exposure and efficiency of preventive measures, played a part. In the 3 factories with lowest average concentrations of dust in each of the atmospheres studied the lowest incidence of rhinitis was found. The incidence of chronic rhinitis was higher in workers exposed to the more hygroscopic dust of finished cement, even with lower concentrations, than in those exposed to dust of raw materials Rhinolithiasis, the form of rhinitis characteristic of cement workers, was found in 209 workers, 6 8 per cent. of the 3,083 examined Perforation of the nasal septum was found in only 4 workers, 2 in each of 2 factories. Bronchitis was not observed to be a direct consequence of exposure to cement dust; its incidence varied rather with the climatic conditions of the [illegible]

[illegible]

creased linear striation (accentuation of the normal bronchovascular network) was found in 57 workers (2 2 per cent) of 2,557 examined Tuberculosis, active or of suspected activity, was found in 41 (1 6 per cent.), residual or cicatricial tuberculosis was found in 169 (6 6 per cent) According to the author the reason why cement dust does not cause silicotic fibrosis is that owing to the markedly hygroscopic property of cement dust the fine particles agglomerate into inert masses on the humid surface of the nasal passages and thus do not reach the bronchioles and alveoli in an active state

The report contains a vast amount of factual detail gained from an investigation planned and carried out with care and precision, and it should prove of considerable value to all those interested in the health of workers exposed to cement dust *E L Middleton*

PARMEGGIANI, L Rilievi statistici sulle pneumoconiosi nella industria del cemento **[Statistics on Pneumoconiosis in the Cement Industry]** *Rass Med Indust* Turin 1951, Nov.-Dec, v 20, No 6, 400-409 14 refs]

This statistical study is based on mass radiographic examinations, between 1943 and 1950 of 5,213 workers in 39 undertakings engaged in the manufacture of cement (3 865) and asbestos cement (1 348), over 50 per cent of the workers were employed in the district of Casalese and they are recorded separately The statistics are given in 8 tables Four of these show the incidence of silicosis in the various occupations of the cement industry, and the results of the examinations normal, increased lung markings reticulation, nodulation, massive silicosis and silicosis with tuberculosis Similar figures are given for the periods of employment The remaining four tables show the results of examinations in the asbestos industry, the classification being modified to indicate the diagnosis of asbestosis as slight moderate and severe, and with active tuberculosis

The processes of manufacture are described The [illegible]

was not due to difference in duration of employment. The results showed that between 1943 and 1950 there were 33 cases of silicosis and 231 of reticulation; the *incidence of silico-tuberculosis* of 0·13 per cent. compares with 0 2 per cent. in other Italian dusty industries; these last results are based on rather small numbers The highest incidence of silicosis was found among miners, followed by labourers in *mines and quarries*, *few* workers in the factories were affected beyond reticulation The incidence of tuberculosis (1·1 per cent) was less than that found in Italian dusty industries generally (2 0 per cent) In regard to duration of employment *reticulation began to appear among miners after 5 years*, and with a frequency of about 1 in 8 *after 20 years'* work, reticulation appeared in 1 in every 3 workers after 20 years; nodular silicosis appeared after 15 years, and massive silicosis and silico-tuberculosis *not before 20 years; among quarrymen and other* surface workers reticulation appeared after 10–20 years Tuberculosis was not related to the period of employment but tended to occur during the early

os cement
asbestos
it in the

former compared with 10 2 per cent in Vigliani's *statistics for the latter The workers most affected* were those employed in the kneading and mixing processes Asbestosis appeared after about 5 years work, and in severe degree after about 15 years' work

E L Middleton

Mancioli, G Le flogosi croniche delle vie aeree superiori nei lavoratori del cemento **[Chronic Inflammation of the Upper Respiratory Passages in Cement Workers]** *Rass. Med Indust* Turin 1954, Jan.–Feb, v 23, No. 1, 7–16 [28 refs.]

case The mixture is next cooked ... various *types of ovens*, a rotary one being most commonly used in Italy This oven is a large steel

cylinder and are afterwards ground ... t powder and sieved through a screen of 900 apertures to the square centimetre

Much dust is raised when grinding and when bagging or otherwise packing the cement, the dust particles being hexagonal or polygonal in shape and measuring 4–12 μ. Workmen *exposed to this dusty* atmosphere have been estimated each to inhale 0 89 gm. of cement dust per day or 270–300 gm in a year

Cement factory stacks, even when fitted with dust-*precipitating equipment*, *have* been found to deposit as much as 40–45 tons of dust within 24 hours over their surroundings.

Mancioli has investigated a number (not stated) of *cement factories in Italy and examined 102 workmen* in all Eleven showed chronic hypertrophic inflammation of the nasal, pharyngeal and laryngeal linings; in 35 only the nasal and pharyngeal mucosae were affected and in 18 the changes were limited to the nasal cavities The nose showed vasomotor disturbances in 6 workmen, ulceration in 15 and perforation in 4 Seventy workmen in all, 68 62 per cent. of the *102* examined, showed an occupational condition *affecting their upper respiratory passages; their* ages and their length of exposure to the hazard varied over a wide range. Examination of these subjects at intervals after a shift showed that nasal discharge was

The subjects were all male, their ages 18 to 55 years and their exposure to risk from 3 montl to 15 years

Mancioli describes the form of occupational nas ulceration which he has *found* and *discusses th action, both irritant and caustic, which cement du* exerts on the whole lining of the respiratory tract though he has limited the present investigation to th upper passages

J. Cauchi

Knop, W. Staubmengen-Messungen in Zementfabri ken **[Measurements of Dust Concentration in Cement Works]** *Zent f. Arbeitsmed u. Arbeitsschutz*, 1955, May, v. 5, No 3, 72–5, 5 figs [11 refs]

In the manufacture of cement *it is impossible* to avoid making dust, *which may escape in clouds* and cover the countryside around the factory; furnace gases escaping from the rotary ovens are particularly heavily charged with dust Estimation of the effici- ... before it can escape ... asons

... ection ... by a filter, these ... 1 fine particles suspended in the main gas stream

The sampling nozzle is equipped with total and static pressure tubes so that the sampling velocity can be adjusted to suit the flow of gas, suction is provided by an ejector drawing through a standard orifice plate *for measuring the rate of aspiration*

Some figures are given for 5 rotary ovens provided with electrical dust-removing equipment When clinker was being produced at about *12 tons* per hour the concentration of dust in the raw flue gas was between 21 and 35 gm. per cubic metre; the cleaned gas contained from 0 25 to 2 4 gm

[There is no discussion of isokinetic sampling and

particle size, or of the statistical technique of sampling which is proving successful in the flues of British power stations] *C. N Davies*

PANCHERI, G Etude de deux pneumoconioses non

Until the beginning of the present century about 80 per cent of the world's supply of sulphur came from Italy, this was changed by the use of the Frasch process of winning sulphur by steam from the extensive deposits in the United States, but sulphur is still mined in Italy and the question of a form of pneumoconiosis existing among the workers remains unsettled, 30 references to the literature are given in this article.

experiments on dogs with sulphur dust, and also made clinical and radiological examinations, he reached the conclusion that sulphur could cause pneumoconiosis, characterized by clinical signs of bronchitis and emphysema and radiological changes resembling those of silicosis; histologically a connective tissue reaction was observed These conclusions were opposed by SCHIAVINA and MOTTURA [see this *Bulletin*, 1948, v. 23, 695].

The present author examined three workers em-

...graphic and clinical examinations of workers at the sulphur mine of Perticara where 1,500 are employed, studies of dust concentrations, analyses of the minerals and experimental research will also be made in the hope of solving the problems which remain.

In connexion with barytosis the author states that deposits of sulphate of barium occur in various parts of Italy and are worked in mines and open quarries, quartz and silicate minerals are present with it, about 500 workers are employed in the industry. Dust is produced in the processes of extraction, grinding and sifting The first case of barytosis in Italy,

absent except in advanced cases when slight inflammation of the upper respiratory passages, bronchitis and emphysema are present This condition can be distinguished readily from silicosis, the radiographic

The radiographic shadows have been seen to diminish on removal from exposure to the dust, leaving only increase of the normal pulmonary markings. Barytosis is, therefore, a benign form of pneumoconiosis

E. L. Middleton

MERKULOV, G Baritoza. [Barytosis] *Arhiv Hig. Rada* Zagreb. 1951, v. 2, No. 4, 498–500, *4 figs. on 2 pls*

A description is given of the X-ray findings in

cent. of silica and which became worn down rapidly in use Many workmen had been exposed to the dust of the grinding process for up to 20 years;

progressed The lesions were very opaque, presumably on account of their content of barium sulphate Trabeculae were eventually seen uniting the individual opacities and giving rise to a characteristic spongy appearance The pleura was not affected The appearance differed from that of silicosis and more closely resembled that of miliary tuberculosis or siderosis. The prognosis was good, however, and the condition had little effect upon the general health The X-ray appearances are illustrated in 4 photographs. *D. J. Bauer*

PENDERGRASS, E. P. & GREENING, R. R. Baritosis. Report of a Case. *Arch Indust. Hyg & Occupational Med* Chicago. 1953, Jan, v. 7, No 1, 44–8, 3 figs

Baritosis is a name given to changes in the lungs

distributed through the lungs (possibly due to small collections of the metal dust rather than to pulmonary nodulations). Such shadows were seen in a group of workers; they were different from those seen in most pneumoconioses, but resembled those reported in the Italian miners These workers were exposed to baryta dust in a lithopone factory in Pennslyvania. Dust counts gave concentrations of 6,000,000,000 and 1,700,000,000 particles per cub. ft. of air. The nodular shadows were denser than those found in silicosis (as might be expected if due to the dust, rather than to tissue changes)

One of these workers who had a routine X-ray in 1927 died aged 71 in 1948 from coronary thrombosis. This man had worked for several years as a coal miner and at another time was exposed to dust of baryta and anthracite. Dusts from these exposures may have aided in the retention of baryta dust in his lungs, as an X-ray diffraction examination of dried lung revealed the presence of barium as barium sulphate. These other dusts had created a condition of anthraco-silicosis The findings of the autopsy, which was most carefully conducted, are given, but they do not establish the existence of any unusual pathological conditions Nor do any symptoms experienced in life remove baritosis from among the benign pneumoconioses. *E. L Collis*

BRANISAVLJEVIĆ, M, KOPAČ, Z., MERKULOV, G. & TEOFANOVIĆ, S Baritoza **[Baritosis]** *Arhiv Hig Rada.* Zagreb 1953, v. 4, No 3, 307–24, 17 figs on 9 pls.

The English summary appended to the paper is as follows —

"There are several barite mines in our country. Mining and milling of barite through a number of years causes baritosis which consists in pathological changes in the bronchi and the lungs of the workers.

"The authors examined 31 workers from a barite mill who had been working from 1–14 years without any [illegible] All c[illegible] dyspr[illegible] the lung. Not one had heart trouble, blood pressure corresponded to age, haemoglobin was without pathological changes, sputum was Koch-negative and urine without pathological findings

"Radiography disclosed in the lung of all workers rare, translucent, flocky nodules different from those in miliary tuberculosis or in silicosis No case was complicated by active tuberculosis or by the influence of the expected silicotic component. The main characteristics of baritosis appeared in three stages according to the dissemination, the translucence and the size of the nodules

"The pathologico-morphological findings of the lung of one such worker who had died of another intercurrent disease pointed to bronchitis chronica catarrhalis The histological finding gave a picture of rarification of the parenchyme of the lung, of atrophy of the lung interstitium and, specifically, of disseminated nodules. Those changes were an evidence of nodular pneumoconiosis

"The postmortem of that case clearly showed that there [illegible] barit[illegible] is a [illegible] or sclerotic tissue. Barium nodules are mostly built of the pigment of barite and contain very little fibrous fibres"

SECTION X

PNEUMOCONIOSIS DUE TO ORGANIC SUBSTANCES

Cotton—Jute—Mowra Seed—Grain and Cereals

SCHILLING, R S F. **Occupational Hazards in the Cotton Industry. II. Byssinosis.** *J Indust Nurses* Univ Manchester 1951, v 3, No 4, 224–30, 2 figs

This is an excellent account of the dust disease of the cotton industry

Byssinosis has been known to occur in the card rooms of British cotton mills for over 100 years More recently attempts have been made to prevent

Some of the cardiovascular deaths should be classified as respiratory deaths and when a correction is made the respiratory death rates of strippers and grinders, between the ages of 55 and 69, were 4 times greater than the corresponding rates for all males In the last 20 years there have been further improvements in the methods of controlling cotton dust by enclosing and exhausting the stripping brush by vacuum cleaning, and more recently by oiling the cotton before it is cleaned Nevertheless, a recent investigation in mills spinning the coarser grades of raw cotton showed that 66 per cent of the 130 men examined were affected All the men were over 35 years old and had had at least 10 years' exposure; 15 men were diagnosed as suffering from permanent incapacity

blow rooms as means of expediting prevention and control. The men who had reached the second stage of the disease could be encouraged to change their work, by leaving the card rooms or blow rooms or going to mills where there is little dust The examinations would also reveal the incidence of all stages of disease and indicate those mills in which dust suppression needed to be improved *R E Lane*

SCHILLING, R. & GOODMAN, Nancy. **Cardiovascular Disease in Cotton Workers: Part I.** *Brit J. Indust Med.* 1951, Apr, v. 8, No 2, 77–90, 7 figs. [23 refs]

This article from Manchester is the first to be

the work are given. Much dust is generated, and those employed are well known to suffer from asthma. The evidence suggesting that cardiovascular disease is more than normally prevalent among these men arises from the occupational mortality statistics published from time to time by the Registrar-General. In his reports in 1891, 1901, 1911, 1921 and 1931, this undue prevalence has appeared. Now a most careful analysis of these data is presented, and every possible factor is considered, including inherited tendency and geographical influences. The relevant data are presented in an appendix. Finally

SCHILLING, R. S F., GOODMAN, N. & O'SULLIVAN, J. G **Cardiovascular Disease in Cotton Workers. Part II: a Clinical Study with special reference to Hypertension.** *Brit J. Indust Med* 1952, Apr, v 9, No 2, 146–56, 1 fig [25 refs.]

Occupational mortality data (the most recent of which deal with the year 1931) support the clinical findings that cotton operatives, employed in the formerly dusty environment of the blow-room and carding operations, used to suffer from pneumoconiosis, but they also indicate the existence of cardiovascular diseases. The study here reported was undertaken to ascertain whether such diseases, especially hypertension, exist now among these operatives. For this purpose 103 men between ages 35 and 65 who had worked in the card- and

blow-rooms were compared with a control group composed of 93 weavers and warehousemen of similar ages employed in cotton mills. Hypertension was considered to be present when the lowest systolic pressure was at or above 150 and the lowest diastolic was at or above 90. The card- and blow-room group had a somewhat higher incidence of hypertension than the control group and some correlation existed between hypertension and the presence of pneumoconiosis. Every effort was made to eliminate other possible influences, such as obesity and heredity.

... records are now

card- and blow ...
symptoms of byssinosis and exhibited a ... e relation between this industrial respiratory disease and hypertension. The investigation might be followed up in other countries where the dust hazard still exists. *E. L. Collis*

VISMANS, J. B M. **Byssinosis.** *Nederl. Tijdschr. v. Geneesk.* 1952, Apr. 5, v. 96 (II), No. 14, 800–807, 4 figs. on pl.

The English summary appended to the paper is as follows :—

"Byssinosis is a disease only occurring among workmen in the cotton industry, mainly among those doing the so-called roving, not before they have been working there for at least five years. First complaints are an oppressed and tight feeling in the chest, initially only on Mondays Cause of death is often ... of the right part of the heart The ... observed himself.
... importance,
... rol of dust
development from cotton ;

DALHAMN, T. & FRIBERG, L Undersokning av arbetare inom bomullsindustrien med speciell hänsyn till forekomst av lungskada. [**Investigation on Cotton Industry Workers with special reference to Lung Injuries**] *Nordisk Hyg Tidskr* 1953, Nos 7/8, 141–7, 1 fig

The English summary appended to the paper is as follows —

"A clinical investigation has been carried out on a material of 40 male workers *in the bale working,* picking, carding and spinning in four cotton industries. The investigation has included the taking of anamnesis, physical examination, routine examinations of blood and urine as well as X-ray and spirometric examinations of the lungs, working tests and intracutaneous tests with cotton extracts

"Four of the workers had probably had symptoms of 'mill fever'. In three cases there was probably emphysema, but on the whole both the lung-function and the physical working capacity were normal It may with some confidence be asserted that the assump- ... between the rather exceptional ...

were on the whole the same ...
tents occurred in the carding rooms (about 150 particles per cm³ of air). Considerably worse conditions had obtained earlier, but good technical protective devices had now been installed Cotton of a high degree of purity had been used, both now and earlier.

"The investigation results do not afford a sufficient basis for the establishment of a general MAC-value for cotton-dust. Where cotton of the degree of purity in question is used, however, a concentration of 150 particles per cm³ air (and probably also considerably higher concentrations) may scarcely be presumed to give rise to lasting lung-injuries even in case of prolonged exposure"

VIGLIANI, E C, PARMEGGIANI, L & SASSI, C. Studio di un'epidemia di bronchite asmatica fra gli operai di una tessitura di cotone. [**Study of an Outbreak of Weaver's Cough among the Operatives of a Cotton Mill**] *Med. d Lavoro.* 1954, June–July, v. 45, Nos. 6/7, 349–78, 3 figs [30 refs] English summary.

An outbreak of weaver's cough or asthmatic bronchitis occurred in a large cotton mill in Italy, it is said for the first time, during the period November 1951–April 1952 These works employ a staff of about 2,000, some spinning and some others weaving, but only the latter were affected, and more especially the supervisory and more skilled employees The mill handles good-quality, long-stapled Egyptian cotton and the authors give an outline of the various processes involved

Workers generally reported sick on a Monday or on resuming work after a period of absence · they complained of cough, dry at first, oppressed breathing and dyspnoea, throat irritation and, less frequently, urticaria and slight rises of temperature. Those who were most severely affected suffered from attacks of asthma both at work and during the night at home. About half the number of weavers were involved, many were unable to complete their shift on a Monday; 44 were on the sick list for longer periods than 10 days

The investigation which is reported in this paper was started only towards the end of March, and the authors were called in when the outbreak had obviously passed its peak They carried out a clinical and X-ray examination of 1,000 weavers, 815 of whom worked at the looms [on page 352 they write of having examined 1,005 subjects, 930 being weavers and 75

being employed on spinning and on finishing and on office duties]

chronic hypertrophic pharyngitis and tonsillitis, but these conditions seemed equally prevalent among spinners and some other workers In the milder cases the attacks of asthma went on for 2–3 months; the more severe cases lasted 5–6 months and required active treatment. The asthmatic condition more particularly affected those with the longest service with the firm and involved 46 per cent of the mechanics who looked after the looms, 26 per cent of the instructresses, 11 per cent of the weavers and 9 per cent. of the loom-feeders; there was an incidence of only 4 per cent among shuttle-layers and cleaners and only 6 8 per cent of staff engaged in preparing the material for the looms had asthmatic complaints and these were of a light nature

There was no evidence of serious organic lung

per cent and there had been noticed an unusual growth of mould in the warehouse, no increased dustiness has been recorded, nor was mould, in the form of a yellowish powder, evident on the looms or by its characteristic smell, though English workers who have studied outbreaks of weaver's cough have recorded such manifestations

In the present study a variety of bacterial and fungal species have been isolated and estimated from the works atmosphere and from materials and other surfaces, and many of the workers have been skin-tested with preparations of these organisms Some striking delayed reactions were produced by extracts of *Aerobacter* [*Bact*] *aerogenes* in all those who showed severe asthmatic bronchitis, in 74 per cent. of less severe cases and in 46 per cent of controls The follow-up of these findings failed to confirm a causative relationship for this organism

The authors have been unable to show that the outbreak was due to an unusual incidence of mould either by demonstrating this or by eliciting appropriate reactions from skin testing They point out, however, that though "thresher's" and "farmer's lung" are undoubtedly due to moulds which grow on wheat and hay, extracts of such moulds do not produce a skin reaction in those affected

The authors discuss a couple of other possible hypotheses and emphasize that they were not given an opportunity of investigating this outbreak of weaver's cough in its earlier stages and that this disadvantage is probably responsible for their failure in the search for a definite cause of this outbreak.

J. Cauchi

FURNESS, G. & MAITLAND, H. B. **Studies on Cotton Dust in relation to Byssinosis. Part I: Bacteria and Fungi in Cotton Dust.** *Brit. J. Indust. Med.* 1952, Apr, v. 9, No. 2, 138–45 [21 refs]

The constituent of cotton dust which causes the symptoms of byssinosis has not yet been determined definitely

In the present study the materials examined were the gross dust removed from raw cotton by the cotton cleaning machines, and the finer air-borne dust collected in the neighbourhood of the machines The raw cotton was chiefly of 3 kinds; fine-grade Egyptian cotton, medium-grade American cotton, and low-grade cotton from Pakistan Microscopical examination of the dust showed Gram-positive bacilli and cocci and bacterial spores, mould hyphae and spores and much fine débris Estimations by culture plating methods of the numbers of viable bacteria present were rendered difficult by the growth of spreading types, and the use of sodium azide, at 1 10,000 in the culture medium, to restrain the spreading growths, greatly reduced the total count. Pour plates and sandwich plates incubated at 37°C. or at 22°C were less satisfactory than surface cultures for the aerobic species, and the last method, with 6 per cent agar plates at 37°C, gave the highest counts, which ranged, according to the sample tested, from 108 to 4,000 million organisms per gm.

Among the aerobic bacteria, the genus *Bacillus* predominated and was represented by *B megatherium*, *B pumilus* and possibly *B coagulans* or *B subtilis* Of the Gram-negative organisms, about 70 per cent. belonged to the genus *Bacterium* and the remainder chiefly to *Achromobacter* with a few *Alkaligenes* from one sample Aerobic *Actinomycetes* and micrococci were occasionally found. The anaerobic types included *Clostridium welchii*, *Clostridium histolyticum* and 4 unidentified strains.

Moulds cultivated were identified as belonging to the *Aspergillus niger* group, *Aspergillus* spp, *Penicillium* spp and *Mucor* sp.

The only pathogenic type, as determined by inoculation into guineapigs, was *Cl. welchii*.

There was a broad difference in the content of viable bacteria according to the origin and grade of cotton, the fine Egyptian cottons giving the lowest and the medium grade American samples the highest counts

J. T. Duncan

CAYTON, H R, FURNESS, G & MAITLAND, H. B. **Studies on Cotton Dust in relation to Byssinosis. Part II: Skin Tests for Allergy with Extracts of Cotton Dust.** *Brit J Indust. Med.* 1952, July, v 9, No 3, 186–96 [19 refs]

This study was to determine whether hypersensitivity is a major factor in byssinosis. It was carried out by hypodermic injections of a number of extracts of cotton dust, which is the material incriminated in the causation of byssinosis. Ten extracts were used, and the method of preparing them is explained. The tests were applied to 291 persons, of whom some were normal people; others were normal, but allergic; others had advanced byssinosis; others early byssinosis; others were mill operatives exposed to the dust, but unaffected; others were mill operatives with little or no exposure. Two types of skin reactions occurred: (a) an early reaction, within 5 to 10 minutes, with a weal and erythema which might extend for 5 to 30 mm. and fade away in a few hours, and (b) a late reaction, best seen if there had been no early reaction; it developed 3 to 4 hours after injection with a small area of redness, increasing in size, thickness and intensity of colour up to 10 to 12 hours, after which it began to fade and seldom lasted over the second day. These reactions varied with individuals and with the strength of the solution used. Nobody reacted with unusual severity to moderate doses

The results are set out in tabular form All the [illegible]

operatives, and normal persons. The fact that some 90 per cent. of normal persons reacted strongly indicates the presence of some toxic substance in the extracts. There are grounds for believing that different substances cause the early and late reactions. No evidence was obtained of a sensitization peculiar to byssinosis. Extracts of house dusts gave results similar to those with cotton dust; possibly a similar allergen exists in both kinds of dust. The study indicates that specific generalized hypersensitivity is unlikely to be the cause of byssinosis.

E. L. Collis

CAYTON, H. R., FURNESS, G., JACKSON, D. S & MAITLAND, H. B. **Studies on Cotton Dust in relation to Byssinosis. Part III: Comparison of Cotton Dust and House Dust by Chemical and Skin Tests.** *Brit J. Indust. Med.* 1952, Oct., v. 9, No. 4, 303–8. [16 refs.]

[illegible] subjected [illegible] All were [illegible] with a [illegible] none of [illegible] was no [illegible] racts of cotton dusts are known to produce two types of skin reactions, an early reaction of weal and flare type, and a late reaction of induration and erythema. Early reactions are considered to indicate allergy. Both extracts gave similar early reactions; but the cotton dust extract caused a reaction in more persons than the house dust extract. Cotton dust extract [illegible]

been determined; and further research is still in progress.

E. L. Collis

VIGLIANI, E. C. Patologia e igiene del lavoro nelle industrie tessili. **[Pathology and Hygiene of Work in the Textile Industries]** *Med d Lavoro.* 1953, Jan., v. 44, No. 1, 1–61 [Numerous refs.] English summary

This paper was read at an International Congress in September, 1952; it makes quite a comprehensive monograph on the subject and provides a useful work of reference. British workers and British legislation on the subject are repeatedly quoted

The *manufacture of textiles has to take place in a* warm, humid atmosphere and the wet and dry bulb thermometer requirements of the British Act are quoted It is pointed out that the different climate *of Italy and indeed of some of the United States* does not allow of exactly the same combinations of heat and humidity being enforced in these countries Pierce's table of the capacity for work in relation to [illegible]

necessary for the manufacture of textiles. The [illegible] have been [illegible] nternal [illegible] land- [illegible] hrough windows, or (iii) the use of adequate glazed fenestration in the walls through which the workers can see out but the outside atmosphere cannot come in or otherwise affect inside conditions

Certain processes in *textile manufacture, e g,* dyeing, are a source of much steam and *mist In* winter especially condensation may occur on the walls and ceilings and the resulting drops of moisture may be prejudicial to the workers and to the textile material itself Such conditions favour *accidents as* well as rheumatic complaints Preventive measures include (i) enclosing as far as possible the containers of hot liquids from which the vapours arise, and (ii) drawing out the vapours at the points where they are formed

The problems of artificial lighting, where necessary, and of protection of textile workers against noise are discussed

The degree of dustiness in textile manufacturing

processes varies with (i) the particular process concerned; (ii) the kind of cotton which is being handled, (iii) the type, dimensions and layout of

stage the signs and symptoms gradually extend to

Byssinosis has been exhaustively studied in Britain, but its investigation in *Italy* has been limited Vigliani gives an account of his own findings from recent enquiries

Weaver's cough is an acute, epidemic condition which affects cotton workers and which has been attributed by some authorities to various bacterial toxins

Vigliani next discusses the effects of dustiness from linen, hemp and jute Wool does not seem to carry

is a malignant, sclerogenic type of pneumoconiosis which is often complicated by tuberculosis or carcinoma "Asbestos warts" are another occupational condition which affects the hands and feet

Dust preventive measures in the textile industry are discussed

Vigliani next deals with occupational conditions due to various chemicals used in the industry, including carcinogenic factors, and with certain pyodermal conditions which have been known for many years to affect silk spinners and which have been attributed to a toxic substance derived from the chrysalis of the silkworm

He discusses the problem of fatigue, which, he admits, is not limited to the textile industry He pleads for the introduction of one or more adequate breaks in the course of each shift and for the improvement of hygiene conditions in general throughout the industry

Mortality and morbidity statistics of textile workers and the incidence of sick absenteeism recorded in various countries are analysed and commented on and Vigliani then stresses the avoidability of many of the accidents in the textile industry The industrial welfare of textile workers depends on (i) the hygienic facilities provided in the factory, (ii) the correct development of human relations, and (iii) an adequate industrial medical service *J Cauchi*

MINISTRY OF LABOUR & NATIONAL SERVICE. **Dust in Card Rooms.** Second Interim Report of the Joint Advisory Committee of the Cotton Industry [THRELKELD, T. P., Chairman]. 54 pp, 3 figs 1952. London: H M Stationery Office [2s]

The Committee was set up in November, 1944, to consider and advise on practical methods of implementing certain provisions of the Factories' Act, 1937, and other problems Experiments have been carried out in individual mills, and research has been done by the British Cotton Industry Research Association As a result of dust estimations made in the course of this work some recommendations are now made, but further work is necessary before definite conclusions can be reached The work done so far shows —

1 It is impossible to remove much "trash" immediately after ginning, and arrangements to do this would be of great benefit.

2 Improved methods of opening and changes in the "taker-in" region can reduce the amount of dust going forward to the card to 10 per cent of that coming in the bale

3 Efficient exhaust ventilation at dust-producing points seems to be more of a possibility than was formerly thought

4 Air-washing reduces dust considerably but the coarser dust is removed to a greater extent than the finer

5 Probably with a coarse filter followed by an electrostatic filter the air could be so cleaned as to

Act, 1937

removal.

There are 5 appendices to the report In the first 4 J. S EVANS and K L. GOODALL describe the results of investigations of the effects of air-washing, the use *of different types of cards, the use of bag filters for* extraction and recirculation of cardroom air, and the oiling of cotton, on dust concentrations The final appendix by Evans describes the methods of dust estimation used *Thomas Bedford*

SUBRAHMANYAN, K. & MAJUMDER, N **Environmental Conditions within Jute Mills.** *Indian J. Med. Res.* 1951, Oct, v 39, No 4, 595–623, 5 graphs

The paper gives the results of a fact-finding survey carried out in two jute mills on the Hooghly River

In most departments in these mills the temperatures were consistently higher than those prevailing outside On nearly 36 per cent of days over a 2-year period the external temperature was 90°F or above, but in some departments 90° was reached or exceeded on 70 or even 78 per cent of the days In terms of effective temperature factory temperatures reached 85° to 90° on 40 to 49 per cent of days in most departments, and there were a few days at both mills when effective temperatures exceeded 90°F

Some dust counts were made in the various departments, with the Bausch and Lomb dust counter The highest counts were found in the batching rooms where fibres are selected, mixed, and softened in machines In the batching rooms at the two mills average counts of 20 5 and 15 7 million particles per cubic foot were found These counts are excessive A count of 3 million particles is said to indicate a degree of dustiness which causes irritation in the nostrils of workers Counts greater than this were found in the preparing, spinning and weaving sections also

Records of absenteeism and accidents were obtained and are recorded. The causes of absenteeism are many, apart from sickness or accident, and no conclusions can be drawn

Production figures showed a seasonal variation with temperature In the six months March to August production (tons per 1,000 man-hours) was least, and temperatures were highest Air speed, relative humidity and illumination gave no correlation

creating air movement

This is an excellent paper describing a valuable study. *Thomas Bedford*

CASCELLI, G *Studio clinico e radiologico dell'azione della polvere di juta sull'apparato respiratorio* **[A Clinical and X-ray Study of the Action of Jute Dust on the Respiratory Apparatus]** *Igiene e San Pubblica* Rome 1954, May–June, v 10, Nos 5/6, 245–66 [21 refs] English summary (8 lines)

The author has examined a total of 50 women workers, all but one of whom have been exposed to the dust hazard in a jute factory for at least 10 years, and he tabulates his findings in each case under the following headings —

Age and duration of exposure,
Family and individual history,
Present symptoms, if any,
Objective signs, with particular reference to the respiratory organs,
Results of X-ray screening and photography, including stratigraphy

As a result of this study, he concludes that (a) jute does not give rise to pneumoconiosis within the definition adopted by the International Labour Office (b) some of the workers did suffer from acute or chronic inflammation of the upper respiratory tract, sometimes made worse through spasm of the bronchial muscle, as a result of this occupational hazard; (c) no dust can be inhaled repeatedly without harm to the pulmonary tissue, and jute, which is more hygroscopic than other vegetable dusts, absorbs moisture from the atmosphere and in the bronchial tree and soon settles within the latter and there exerts its irritant effects, (d) jute dust does not favour either the incidence or the progress of pulmonary tuberculosis

Jute fibres are obtained from *Corchorus capsularis* and *C olitorius*, family *Tiliaceae*, and these are produced by small farmers through intensive cultivation in India, mainly Bengal Jute cultivation has been attempted in Ceylon, Formosa, Sumatra, Java, China, Algeria and Central Africa with little success The processes of working the jute fibre are dealt with in this paper. *J. Cauchi*

KALAPESI, N. M **Respiratory Complaints among the Workers in Mowra Seed Crushing Mill and their Remedies.** *Proc Soc. for Study Indust Med.* Jamshedpur, India 1953, Sept, v. 5, No 3, 128–30

Oil from mowra seeds [*Bassia* of the British Pharmaceutical Codex] is largely used for soap-making in India, and the fixed oil for an edible fat. The defatted meal will remove earthworms from the ground. The seeds contain 50 per cent fat which consists principally of palmitic, stearic and oleic acids The oil contains liquid and solid acids and is called mowra butter The seeds are powdered in a crushing machine, the powder being conveyed to steam cookers The hot powder is next placed between mats and hydraulically pressed, when the mowra oil trickles down into a pit During these various processes dust escapes into the air and falls on to the floor, whence the workers carry it on their feet elsewhere

The powder when inhaled irritates the air passages and causes sneezing, running at the nose and cough Continued exposure does not necessarily establish any immunity, but may do so, some workers are less affected than others Some develop an allergic type of asthma, 3 cases were reported among 45 men who had worked about 10 years; they improved when transferred to another department. Conjunctivitis and congestion of the eyes also occurred Possibly the asthma was due to sensitization, as antihistamine drugs were found to be valuable in treatment.

Recommendations are made that the crushing machines and mechanical conveyors should be so constructed that mowra powder does not escape into the

air and on to the floor, the dust being drawn away by exhaust fans (Care must be taken against explo-

another is suggested E L Collis

DUNNER, L. **Pneumoconiosis and Tuberculosis in Dockers dealing with Grain and Seeds.** *Brit J Radiol* 1949, Dec, v 22, No 264, 717–22, 4 figs

The lungs of 100 dockers, who handle mainly grain and seeds but also some iron ore, sulphur and other cargoes, have been examined radiologically because the men had complained of respiratory symptoms, especially of shortness of breath Twenty-nine radiographs showed no lesion in the lung, 22 were interpreted as simple pneumoconiosis, 43 as tuberculous (36 active, 7 healed), 3 as doubtful tuberculosis or pneumoconiosis, and 3 as bronchial carcinoma These figures are not to be taken as giving the true incidence of tuberculosis or of pneumoconiosis in grain workers.

H E Harding

DUNNER, L & HICKS, M S **Bronchial Carcinoma in Dusty Occupations. Observations in Boiler Scalers and Grain Dockers.** *Brit J Tuberculosis* 1953, July, v. 47, No 3, 145–9 [13 refs]

Reporting 26 cases of bronchial carcinoma in 2 groups of workers at the seaport of Hull, the authors, from their observations between 1946 and 1952, add a further contribution to the growing evidence suggesting that this condition may be associated with certain dusty occupations

Among some 2,500 dockers handling grain, seeds, and other dusty cargoes, there were 20 cases, 3 of them at post-mortem examination showing evidence of associated pneumoconiosis In this same "population" 80 cases of pulmonary tuberculosis and 35 of pneumoconiosis have been discovered In a comparable population of dockers not exposed to dust, no evidence of bronchial carcinoma has been found

In the other occupational group, that of boiler scalers [though the population at risk is not given] there have been 17 cases of pneumoconiosis, 4 of pulmonary tuberculosis and 6 of bronchial carcinoma, one other sufferer from cancer had also worked as a docker

Posing the question whether there is a high incidence of bronchial carcinoma in grain dockers and boiler scalers, the authors also refer to the increasing mortality from this disease in the general population of Hull over a similar period. They presume that the increased incidence of bronchial carcinoma of dockers cannot be attributed wholly to the dust factor, but may be due to the "as yet unknown factor responsible for the increase of carcinoma in the general population" The association of pneumoconiosis and bronchial carcinoma is also referred to

[In such studies of particular small occupational groups, accurate incidence rates, which would lend themselves to statistical analysis, are notoriously difficult to obtain Nevertheless, the inability to apply reliable statistical interpretation does not

DE COMNÈNE, J S & BESSON, J La pneumokoniose a poussières de céréales **[Pneumoconiosis due to the Dusts of Cereals]** *Arch Malad Professionnelles* Paris 1950, v 11, No 5, 459–70, 9 figs [15 refs]

The claim is advanced that dust from such cereals as barley, wheat and oats can cause pneumoconiosis, and published work is quoted in support Experiments are described in which guineapigs were exposed to cereal dust for ½ to 1 hour for 3 or 4 sessions per week during 100 to 245 days The dust contained sharp fragments of vegetable hairs and such were found in the lungs of the animals The lungs showed changes which are divided into three stages, passing from bronchiolitis with abrasion or perhaps destruction of the epithelium of the bronchi, the bronchioles containing polynuclear cells and dust

dust, or to histamines in the dust, or to bacteria

the noxious agent, and the authors are compelled to blame the dust as such No evidence of susceptibility to tuberculosis was found The dust is generated when grain is being transhipped to land, often by mechanical elevators and chutes Eighty-four men employed in the port of Marseilles were

attacks become more and more frequent and associated with asthmatic attacks, while the men become dyspnoeic and cyanotic Of the 21 cases detected,

recover slowly *E L Collis*

CHAUMONT, A. J. & WEIL, E. Étude de la poussière de sorgho comme agent pathogène **[A Study of the Dust of Sorghum as a Pathogenic Agent]** *Arch. Malad. Professionnelles.* Paris. 1954, v. 15, No 5, 360–65, 3 figs.

A man who for many years had worked on the unloading of grain-ships came under notice with a respiratory syndrome of intense dyspnoea, and incessant cough with abundant sputum The grain, known as "dari" was moved by elevators, but there was always considerable escape of dust The grain came *from Syria and was sorghum,* used as cattle food Rest at home improved the man's condition and he resumed work away from exposure to dust. Examination of the dust showed about 30 per cent of it to be of vegetable origin, and the rest to be mineral. The vegetable portion contained hairs from the outside of the grain, and grains of pollen Some of the particles were as small as 2μ at their narrow end Some 55 per cent. [illegible] as free silica or [illegible]

Hairs were fo [illegible] advanced that lo [illegible] tion of such cereal dusts will set up a pneumoconiotic condition, and one case is quoted of a peasant woman whose lungs showed, after death from right heart failure, massive hard fibrosis More of such autopsies are wanted Steps should be taken to minimize *this dust hazard, if possible at its source of origin* in Syria. Respirators, as at present supplied, cannot be considered efficient *E L Collis*

NIYOGI, A K, SWANSTON, Catherine & TAIT, P. **Respiratory Disease in Industry due to Dusts of Plant Origin. Maltsters: a Preliminary Report.** *Trans. Ass. Indust Med. Officers.* 1951, July, v. 1, No. 2, 94–5.

RUTTNER, J. R. & STOFER, A. Getreidestaub-Pneumokoniose **[Grain-Dust Pneumoconiosis]** *Schweiz. med. Woch.* 1954, Dec. 25, v. 84, No. 52, 1433–6, 7 figs. [13 refs.]

This is a case of pneumoconiosis occurring in a grain miller. He had occasionally dressed the grindstones, which were siliceous, but otherwise had no exposure to dust except in the grain mill.

The symptoms and course of the disease resembled [illegible] gestion of the liver and lungs Autopsy showed moderately severe fibrosis of the lungs, thickened pleura and fibrotic changes in the lymph glands, bullous emphysema, chronic bronchitis, cylindrical bronchiectasis and bilateral hydrothorax, hypertrophy of the right heart and changes in other organs. Histological examination showed tissue changes resembling those of silicosis but sections of lung and lymph glands showed no evidence of mineral particles, after ashing and examination by X-ray diffraction analysis. On the other hand histological sections of the nodules showed that the contained particles were of vegetable origin and could be identified botanically as grain dust. In spite of the morphological similarity to silicosis the action of quartz and silicates as a cause of the fibrosis could be excluded and the condition was classed as grain-dust pneumoconiosis. Illustrations show the radiographic appearances and histological sections of the fibrotic nodules and the granulation tissue containing vegetable dust particles

E. L. Middleton

SECTION XI

DUST SAMPLING AND ANALYSIS

General—Threshold Limits—Sampling—Instruments. konimeters; impingers; impactors; scrubbers; spiral samplers; precipitators, thermal, electrostatic; tyndallometers; densitometers; filters—Pipette Analysis—Measurement—Identification: staining; chemical analysis; physical analysis; thermal analysis; X-ray diffraction analysis

DAVIES, C. N. [D Sc.] **Dust is Dangerous.** With a Foreword by Sir George BARNETT pp xvii+116, frontispiece, 30 pls & 23 figs 1954. London. Faber & Faber Ltd, 24, Russell Square, W.C.1. [21s]

The title and size of this book might lead one to expect an easy dissertation on a slogan It is in fact something very different The author, who has spent many years on fundamental research on the subject, says in the Introduction to his book " What it seeks to do is to explain and classify the dangers of dust, and to set out general principles for assessing and dealing with dust problems " The conception of dust here includes solid particles, mist and fume and chemical substances which can exist in the atmosphere in those forms

There are 6 chapters The first, entitled " Dust hazards of the industrial worker ", deals with recogni-

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1930,

1952;

the poisoning of persons living near beryllium factories; microbic infections carried by dust par-

tion, the respiratory tract is clearly and simply shown in a line diagram and a few illustrations and the behaviour of particles in the air stream is described *The characteristics of different dusts in* their action on the tissues and the eventual effects on the individuals are traced. Many references to the literature run throughout the book but are relatively more numerous on this part of the subject.

The second chapter is on dust sampling The methods available include measurement of air-borne dust by light scattering and light screening, sampling through orifices as by aspiration of the dust cloud into a tube, by sedimentation in closed cells, by deposition aided by electric, thermal or inertia forces; by filters, or by impingement. Assessment of samples involves determination of the quantity of dust in relation to the volume of air from which it was taken, and of the sizes of the particles and their composition The most recent methods used for the identification of dusts are discussed· X-ray diffraction analysis, Geiger-counter X-ray spectrometer, optical and microscopic methods; by staining The question of the limits of visibility in particle counting and the use of photography, of photocells and electronic recorders are discussed The technique of routine counting and sizing of dust samples is likely to persist, and here the procedures

mental conditions

Preventive measures are discussed in the third chapter The 5 cardinal principles, in decreasing order of importance, are stated substitution of a harmless for a dangerous substance; dust suppression at its source, removal by local exhaust; general ventilation to dilute the harmful atmosphere; personal protection of the exposed worker. There is nothing new in these principles, which have long been the basis of preventive practice in Britain, but discussion of them in the light of scientific experiment and world-wide experience makes a very valuable contri-

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Chapter 4 is concerned with radio-active dusts Here a useful diagram of the uranium disintegration series of elements and their half-lives is given The subject of radio-active dust and of radon and thoron in relation to the causation of lung cancer is discussed. This chapter concludes with a discussion on the practical aspects of detection of radio-active dust, precautions in handling these materials including radio-active isotopes, maximum permissible concentrations and monitoring of work-places and personnel.

House and non-industrial dusts are discussed in

Chapter 5, which includes the subject of allergy, the composition of house dust, and the possible action of dust as an agent in the spread of bacterial and virus diseases

Chapter 6 is devoted to the important subject of dust explosion It includes detailed discussion of explosive dust clouds, explosion limits of concentration of different gases and solids, methods of ignition of dust clouds by flame, hot objects, radiation, mechanically or electrically produced sparks, or by spontaneous combustion, the concentration, particle size and other factors. Finally precautions against dust explosions are considered, with special emphasis on the imperative *necessity for cleanliness and avoiding* any accumulation of dust on ledges, etc Methods of controlling effects of explosions by providing reliefs where explosion is a danger inherent in the process and of preventing spread of explosions in coal mines by stone dusting are considered.

The reader of this book has the satisfaction of knowing that the facts stated, the opinions expressed and the ... based on a wide knowledg ... a record of h ... he book can ... to all managerial and technical executives who are responsible for the safety and health of workpeople The bibliographies, with some 170 references from the text, and a useful index enhance its value as a work of reference. The photographic illustrations and the line diagrams are most *helpful* *E L Middleton*

FORBES, J J, DAVENPORT, Sara J. & MORGIS, Genevieve G. **Review of Literature on Dusts.** *U S. Dept of the Interior Bureau of Mines Bull. 478* Wash. 1950, pp iv + 333 [657 refs.]

This review is a revision of the Bureau of Mines Bulletin, No. 400, issued in 1937, it includes data which have been published or made *available* since 1937. While no attempt has been made to include all references to literature on the subject the most important probably have been noted It is international in scope, with an emphasis, naturally, on American work and experience It deals with the subject in relation to the definition and classification of dusts, their physiological action on the respiratory organs, the incidence of exposure to dust in various industries and in different countries The types of pulmonary disease caused *by dust are discussed*, with references to the aetiology, pathology, diagnosis and course Physical considerations and methods of prevention occupy an important and complete section of the review; determination of atmospheric dust content, views on permissible air dustiness, and engineering methods for the control of dust in the prevention of disease are included; medical measures *include* clinical and radiological examinations, and references are made to various systems of treatment, including that by the inhalation of aluminium powder. The economic and legal aspects of dust diseases and compensation in different countries are dealt with.

This small compact volume contains a mass of

...

book.

E. L. Middleton

DRINKER, Philip [S B, Ch.E] & HATCH, Theodore [B S, S M.] ***Industrial Dust. Hygienic Significance, Measurement, and Control.*** 2nd Edition. pp. x + 401, 148 figs 1954 London McGraw-Hill Publishing Co Ltd, 95, Farringdon Street, E C 4 New York Toronto McGraw-Hill Book Co, Inc [71s 6d . $10 00]

Only *those familiar with the first edition of this* work, published 18 years ago [this *Bulletin*, 1937, v 12, 82], will fully appreciate the amount of painstaking research which has been carried out in recent years, much of it by the authors, which is embodied in this new edition Industrial diseases, especially those due to inhaling dust, present two aspects; first, their diagnosis at the hands of the physician; and, secondly, their prevention, where the physician has to retire in favour of the engineer and the chemist *Hence no book dealing with dust diseases, the pneumo*conioses, can be adequate unless both aspects are portrayed Usually, the medical view predominates, leaving the engineering side poorly described The ideal is for both sides to be dealt with by an expert, as is done here In this book the preponderating weight is on the engineering side, as it comes from the pen ... bears the impress ...

descriptions of caisson disease, miners' nystagmus, writer's cramp, noise-deafness and vibration neuroses —but here we incline to think that the physician is *somewhat neglected* *Only knowledge of the changes* dust may induce in the lungs can determine what may be needed in prevention How different are the lung changes in advanced silicosis and pronounced byssinosis or manganese poisoning? In the first the patient is finally carried off by superimposed tuber- ...

...

stress laid upon size of dust particles The larger a dust particle, the less likely is it to be injurious, the smaller the particle the greater surface per unit of weight does it offer to chemical interactions Only particles 5 microns and less get down into the alveoli and *the most active are those of 0 5 micron or less* While 5 microns seems a limit of largeness, no limit

* v I, 317

is suggested for smallness, even down to particles which exhibit Brownian movements under the microscope This matter is of the utmost importance to the engineer called upon to keep the air healthy to breathe The smaller the particle, the more likely is it to be carried into the depth of the air-passages and to undergo chemical reactions when there. No aspect of this matter of dust suppression and removal escapes notice Particular attention is directed to

air masks are discussed but they are rightly looked upon as the last resort when all other means have failed Even if they are efficient the workers decline to wear them for long *E L Collis*

GUTHMANN, K Industrieller Staubauswurf [**Dust Emission in Industry**] *Staub* Düsseldorf 1951, Mar 15, No 24, 11–29, 1 chart [15 refs]

This is a comprehensive review chiefly of the non-German literature on the dust content of the air in mines and factories and in gases from chimneys of foundries, smelting works, power stations, chemical factories, etc Accepted and recommended standards

WATSON, H H **Dust and the Ventilating Engineer. I. Pulmonary Diseases due to Dust. Some Physico-Physiological Considerations.** *Heating & Ventilating Engineer* 1952, June, v 25, No 300, 540–45, 5 figs

DAVIES, C N **II. Physics of Airborne Dust.** *Ibid*, Aug, v 26, No 302, 52–60, 18 figs

BURDEKIN, J T **III. The Estimation of Dust.** *Ibid*, Sept, No 303, 108–17, 1 fig [36 refs]

MATHESON, D, WOODS, H **IV. Dust Explosions in Factories** [MATHESON] *Ibid*, Oct, No 304, 150–55 **Protective Measures** [WOODS] *Ibid*, 155–9

COSBY, W T **V. Electrical Precipitation.** *Ibid*, Nov, No 305, 198–207, 7 figs [14 refs.]

STAIRMAND, C J **VI. The Fundamental Mechanism of Dust Collection by Impingement and Diffusion.** *Ibid*, 1953, Feb, No 308, 343–52, 8 figs

LAWRENCE, B G **VII. Application of Air-Cleaning Devices.** *Ibid*, Mar, No 309, 386–96, 15 figs

YOUNG, R. H **VIII. Dust Conveying.** *Ibid*, Apr, No 310, 469–77, 10 figs [Refs. in footnotes]

BILLINGTON, N S **IX. The Testing of Air Filters.** *Ibid*, May, No 311, 495–9, 1 fig

I This paper gives a very brief survey, by a physicist, of the origin and nature of the pneumoconioses, and of the deposition and retention of dust in the lungs Safe levels of dust concentration are discussed

II This paper gives a popular account of the behaviour of air borne clouds of dust The rate of settling and the range of transport of particles of different sizes and under various conditions are given, and the conditions under which deposition will occur are outlined The physical processes involved in deposition are discussed in relation to particle size The processes considered are gravity, interception and inertia, thermal deposition, sonic and ultrasonic coagulation, diffusion and coagulation Where appropriate, air cleaning devices based on these processes are described The adhesion of dust particles once deposited is explained

In view of the current interest in atmospheric pollution, this paper will be of considerable interest to the general reader

III This paper describes briefly the instruments available for dust estimation, and indicates the nature of the information each provides

outlined and the identification of constituents is discussed

IV (i) The conditions under which dust explosions can occur are outlined, and it is concluded that inflammable dust concentrations are bound to occur in some cases Precautions must aim at containing the explosions which may ensue The isolation, and where possible the prevention, of high dust concentrations, and the elimination of sources of ignition, are discussed Subdivision of plant and other methods of limiting the extent of explosions, and explosion relief devices designed to limit the damage they cause, are described

(ii) The author summarizes the provisions of the Factories Act, 1937, relating to dust and fumes He then points out that it is sometimes possible to modify processes to prevent dust formation, or to employ materials whose dusts are less dangerous Otherwise dust control must be employed. Various methods are described

V This paper consists largely of an outline of the principles upon which electrostatic precipitators work. The latter part includes notes on various operational features of these precipitators. [It is

marred by a considerable number of typographical errors in formulae and equations]

VI. The author describes the physical principles of particle capture by impingement on and by diffusion to fibres and drops From these principles he deduces the restrictions imposed on the design and operation of filters and sprays. The relation between capture and particle size is stressed, and the data are summarized in useful graphs An outline of the mathematical theory (by C H BASANQUET) is given in an appendix

VII. The various uses of air filtration are classified. The use determines the criteria on which choice of plant is based, and these are specified. A number of methods of industrial air purification are described briefly

VIII. The author describes the mechanism of transport of dilute suspensions of small particles in pipes carrying air at relatively high speeds Duct design, dust separation, and explosion risks are also discussed

IX
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and the effect of particle size distribution in the determination of their efficiency

John McK Ellison

FIRST, M. W. & DRINKER, P. **Concentrations of Particulates found in Air.** *Arch. Indust. Hyg. & Occupational Med.* Chicago 1952, Apr., v. 5, No. 4, 387–8, 1 chart.

This paper introduces a delightfully lucid chart on

against concentration (gm cu m) of air-borne material.

J. McK. Ellison

BALGAIRIES, E & QUINOT, E Empoussiérage des bowettes et travaux au rocher [**Dustiness of Drifts and Workings in Rock**] *Rev Méd Minière* Douai. 1950, v. 3, No 12, 190–99, 6 charts

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Dust-sampling was done with the Le Bouchet filter apparatus, and particles were counted and measured microscopically

With dry-drilling the median concentration of particles below 5 microns in size was 4,000 per cc, and the probable limits were 1,600 and 9,000 particles per cc Wet-drilling gave a median concentration of only 600 particles per cc, with probable limiting counts of 300 and 1,300 Mechanical loading (with spraying of water before and during the operation) gave a median count of 1,200 particles

There were in all cases few particles larger than 5 microns

The authors conclude that in places reputed not to be dangerous from the standpoint of silicosis the dust concentration is of the order of 500 particles per cc. In places where work is not in progress concentrations are lower, commonly about 200 to 300 particles.

The paper is based on the results of 765 dust samples.

Thomas Bedford

KOE

In order to study dust transport and deposition, coal dust was blown into an underground gallery of 200 m length Trays were put at various heights and distances to measure dust deposition The dust was weighed and its size distribution determined by air elutriation (Gonell-separator) A filter was used to sample the air-borne dust which could be analysed in the same way.

It was found that dust settlement did not depend on Stokes' law but that the dust settled according to an exponential function, if the air velocity was high enough to give turbulent flow, above 0·6 m /sec (ca 100 ft /minute) The number of particles settled

from their source

The above regularities hold for dust concentrations above 10 to 30 mgm per cubic metre and for air velocities up to 5 m /sec. such as occur under normal German coal mining conditions At lower dust concentrations the chances for collision are not sufficiently great and at higher air velocities settled dust is raised again

G Nagelschmidt

DAWES, J. G. **Notes on Physics of Dust Dispersion.** *Ministry of Fuel and Power Safety in Mines Research & Testing Branch. Res. Rep. No 3.* London 1950, Mar, 37 pp, 16 figs.

OLDHAM, P. D **The Nature of the Variability of Dust Concentrations at the Coal Face.** *Brit. J. Indust. Med.* 1953, Oct, v 10, No 4, 227–34, 6 figs [13 refs]

Dust concentrations in a coal mine vary much from place to place and from time to time In this paper the author considers the nature of such variability,

level of dustiness The standard deviation is very closely a constant proportion of the mean concentration. From this finding it is possible to estimate the accuracy with which one can determine mean concentrations from numbers of thermal precipitator samples With 10 such samples, the 95 per cent fiducial limits of the mean are 73 per cent to 137 per cent of the calculated mean—a range of 64 per cent Even 50 samples only reduce this range to 23 per cent

The desirability of automatic dust-sampling instruments is urged, for it is said that these alone can sample inexpensively for long enough periods to reduce this sampling error Such instruments are also desirable from consideration of the aetiology and rate of appearance of pneumoconiosis

For non-anthracite collieries approved conditions with respect to air-borne dust require that the dust concentration shall be not more than 850 particles per cc between 1 0 and 5 0 microns in size. The

that conditions are taken as "approved" if 90 per cent of samples taken when work is in progress on a coalface do not exceed 850 particles per cc The

DAWES, J G & SLACK, A **Deposition of Airborne Dust in a Wind Tunnel. (Interim Report.)** [Porto- No. 105 igs. [15

The deposition of airborne coal dust from a turbulent air-stream on the floor, roof and sides of an airway and on the vertical surfaces of a "free standing roof support" (roof prop) has been investigated Measurements have been made in a laboratory dust tunnel of cross section 1 ft × 1 ft, and in an underground roadway At any point the floor deposition of particles of a given size is proportional to the terminal velocity of particles of this size and to their concentration in the air-stream, it decays exponentially with distance from the dust source at a rate dependent on the air velocity and the airway dimensions

R L Gordon

BRADSHAW, F, GODBERT, A L & LEACH, E **The Deposition of Dust on Conveyor Roads.** *Safety in Mines Research Establishment* [Portobello St, Sheffield] *Research Rept* No 106 1954, Oct, 62 mimeographed pp, 22 figs [3s 3d]

In considering the deposition of coal dust on conveyor roads in coal-mines it is convenient to distinguish 3 types of dust, (1) that deposited upon the road surfaces from the air, (2) that deposited rapidly beneath the conveyor belt, partly upon the conveyor structure and partly upon the floor beneath the conveyor, and (3) that in the coal upon the conveyor belt In this study the inflammable part of the coal dust in a deposit has been assumed to be that finer than the 60-mesh (B S S) sieve, and only dust of this size has been considered All three types of dust have been investigated on two conveyor roads in a Yorkshire colliery and other roads have been surveyed for an estimate of the deposition of air-borne dust

The results of the surveys have been considered from 3 points of view, (1) an estimation of the hazard to which the dust gives rise; (2) the routine sampling of the dust, and (3) the use of the depositions as a control method for checking the dustiness of the road

From the measured depositions of airborne dust on the periphery of the road the explosion hazard has been calculated The tonnage of the coal to be won in order to bring the road at various points to a dangerous condition has been computed and from this information the frequency of

continual sampling of these dust depositions it seems desirable

to sample both the dust on the road sides and the dust beneath the belt. On the two roads surveyed in this investigation, control sampling for the dust upon the road sides, which was a simple procedure, gave useful information on trends of dustiness despite the

the operation of the dust suppression devices had been brought under appreciably better control.

The full results of the investigation are shown in a series of informative graphs. *Thomas Bedford*

BERG, P Bruchbau und Silikose Moglichkeiten zur Bekampfung des Gesteinsstaubes in der Grube vom Standpunkt des Bergmanns [**Rock Caving and Silicosis. Rock Dust Control Underground as Seen by a Miner**] *Bergb Rdsch* Bochum 1950, Aug, v 2, No 8, 315–17

system is used in the Ruhr to a great extent

came on 40 mechanical picks driven by compressed air began to work and the rock dust was blown about everywhere Frequently the whole roof had not come down during the night and large pieces fell during the subsequent coal-getting shifts, raising great clouds of rock dust At the beginning of the coal-getting shift the free flow of air along the face was obstructed through all the equipment, the ventilating current was pressed into the gob and a lot of dust was blown along the face and mixed with the fresh air No method of dust control in caving is known

The working of the coal plough is described from another face where the seam was only 2 ft 6 in thick Work here was continuous and a mixture of rock and coal dust arose all the time

The arrival of pneumatic drills has made shaft sinking one of the dustiest processes in mining, where in the past up to ten such drills may have been used in close proximity, dry and without any dust control Under such conditions the nose quickly clogged up and breathing took place entirely through the mouth

the point that heavy work in dust leads always to

of the paper is to recommend that some such foam filter in the mouth should be used in addition to other techniques of dust control *G. Nagelschmidt*

footnotes]

JUTZI, W Beitrag zur Kenntnis der elektrischen

rels]

Although much is known about the electrical charge of colloidal particles in liquid systems, there is little known about number and sign of charges in aerosols

The author first reviews existing knowledge (relation of charge to origin of system and the techniques available for determining the charge) He then describes the apparatus he was using, a modified ultra-microscope arrangement, where the particles fall under gravity and are deflected sideways by a vertical electric field. Photographic registration was used and from the records it was possible to determine size and charge of individual particles

The materials examined had a size range of 0 3–3 μ and were: quartz and anatase powders, hexadecane droplets and particles of ammonium chloride produced by mixing the vapours of hydrochloric acid and ammonia All materials were suspended in normal, dry laboratory air.

The quartz powder was found to be bipolar, *i e*, it carried equal amounts of positive and negative charges and 95 per cent. by number of the particles were charged The number of charges per particle was proportional to the surface and corresponded to 1×10^{8} electrostatic units per cm^2.

In the anatase powder there were more positive than negative particles irrespective of size. With the hexadecane 93 per cent of the droplets were uncharged and the remainder were bipolar. Most of the charged droplets carried only one charge each irrespective of their size The ammonium chloride also was initially uncharged but a symmetrical bipolar charge was rapidly obtained when the aerosol was allowed to age

G. Nagelschmidt

GESSNER, H. Einige Ergebnisse von Staubunter-

data on dust concentrations and composition obtained in a few dusty environments, such as foundries, slate mines, slate working sheds The methods used are gravimetric sampling, followed by sedimentation analysis and chemical and mineralogical analysis of the fraction below 10 microns Microscope counts obtained by a settling chamber technique are also

AMERICAN INDUST HYG ASS QUARTERLY 1955, Mar, v 16, No. 1, 27-39, 4 figs [25 refs]

(38-9)]

The establishment of threshold limits in the hygienic

array of new organic compounds are being adapted for use, and each calls for the fixing of some limit of safety. *Considerable attention must be paid to suspected carcinogenic substances, such as benzpyrene* During the past year the Committee on Threshold Limits of the American Conference of Governmental Industrial Hygienists have added 37 new materials as requiring threshold limit values, and have created a tentative list of undecided substances "On-the-job" experience and investigation are invaluable; but they involve human experiments.

T. HATCH deals with permissible dustiness Dust of free silica, with its capacity for originating silicosis and a susceptibility to tuberculosis, is mainly considered. The formula is advanced:—"Multiply the percentage of free silica by the total particle dust count If the result is under 5 million, the condition may be considered permissible If the result is over 5 million, the condition may be considered too high . This formula is not applicable to any dust containing less than 5% free silica." [This formula does not consider size of particles]

Silicosis is the hazard mainly considered in the light of experience drawn from South African gold mines Information is also quoted from American data concerned with granite-cutters, pottery workers, non-ferrous metal miners and anthracite miners. Industries may be grouped as those where a definite hazard of silicosis exists, those in which the hazard is borderline, those in which the dust produces only simple pneumoconiosis, and nuisance dusts In the last no limit of dustiness is needed Continued teamwork between industrial physicians, hygienists and epidemiologists is required to complete the work of determining safe dustiness

notable instances are quoted of gases unpleasant, but not toxic, of gases toxic but not unpleasant, of

fume fever is caused by many metal fumes, particularly those of zinc Available information indicates that the accepted threshold limits for lead oxide may be increased, whereas that for iron oxide might be decreased *E L Collis*

ARCH. INDUST HYG & OCCUPATIONAL MED Chicago 1951, Oct, v 4, No 4, 398-400 **Threshold Limit Values for 1951 adopted at the Meeting of the American Conference of Governmental Industrial Hygienists in Atlantic City, N.J., in April, 1951** [FREDERICK, W G, Chairman]

This is a list of gases and vapours, toxic dust, fumes and mists, mineral dusts, and radiations For gases and vapours the threshold limits are given in p p m for 118 substances. For toxic dust, fumes and mist the list includes 27 substances, with limits expressed in mgm per cubic m For 11 mineral dusts the limits are given in m p p c.f [million particles per cubic foot], and for 6 forms of radiation in roentgens per week or microcuries per cubic m.

No comments are given

Charles Wilcocks

* v II, 365

ARCH INDUST HYG. & OCCUPATIONAL MED Chicago 1952, Aug, v 6, No 2, 178–80 **Threshold Limit Values for 1952 adopted at the Meeting of the American Conference of Governmental Industrial Hygienists in Cincinnati, in April, 1952** [COLEMAN, A. L, *Chairman*].

This list is much the same as the list issued in the *previous year [this *Bulletin*, 1952, v 27, 750] Most of the accepted limits remain the same, but a few substances have been added, and some (under the heading Radiations) taken away.

Charles Wilcocks

ARCH INDUST HEALTH Chicago 1955, June, v. 11, No 6, Sect 1, 521–4 **Threshold Limit Values for 1955 adopted at the Seventeenth Annual Meeting of the American Conference of Governmental Industrial Hygienists, Buffalo, April 24–28, 1955** [COLEMAN, A L, Chairman].

DAVIES, C N **Dust Sampling and Lung Disease.** *Brit J Indust Med* 1952, Apr, v. 9, No 2, 120–26, 4 figs [16 refs]

This paper discusses the potentialities of instruments designed to sample only that fraction of an air-borne dust which endangers health, and elaborates the characteristics required Only the finer particles reach the alveoli, and in investigations concerned with lung disease these must be selected

The advantages of selective sampling are discussed in relation to the type of dust, and it is concluded that it is only worthwhile with slow-acting dusts The retention of these has been studied by other workers both by analysis of exhaled air and from an autopsy of miners' lungs Various recent data of these kinds are reduced to a common basis of unit density, and adjusted to the same retention of particles of 1μ in diameter, this gives good agreement between different authors, and discrepancies are discussed The effects of breathing rate and volume of tidal air on alveolar particle retention probably cancel, but upper-lung deposition increases at high rates of air intake From the lung particle retention it is concluded that 100 per cent of particles below 1 5–2 μ diameter, and above this size a proportion decreasing to 50 per cent at 5 μ, should be sampled by a selective sampler An elutriator accepting 50 per cent at 5 μ diameter is suggested, as this is affected by density and shape factors in the same way as bronchial and alveolar deposition

J McK Ellison

WATSON, H H **Dust Sampling to simulate the Human Lung.** *Brit J Indust Med* 1953, Apr, v 10, No 2, 93–100, 7 figs. [11 refs]

In this paper the author deduces the particle size distributions obtained by applying various methods of selective sampling to specified coal and quartz dusts He then compares these distributions with that calculated by applying to the same dusts the data obtained by BROWN *et al* [this *Bulletin*, 1950, v. 25, † 1254] in experiments on the retention of China clay dust in human lungs

Penetration to the lungs is determined by sedimentation velocity. This is measured by conifuge (see SAWYER and WALTON, *J Sci Instrum.*, 1950, v. 27, 272) for coal (3 types), China clay, and quartz, and in each case is compared with the mean projected diameter By combining these data with those of Brown *et al* standardized lung deposition curves are calculated for coal and quartz These curves are compared with the selected samples which can be obtaining by using (1) elutriation (comparison based on computation); (2) impaction (dismissed briefly); (3) centrifugal separation by cyclone (comparison based on experiment), and (4) selective counting The performances of (1) and (3) are calculated in terms of number, surface area, and mass, and are compared with the corresponding lung depositions for various coal and silica dusts. In each case reasonably consistent results are obtained The use of selective sampling of this type is discussed.

John McK Ellison

HARRIS, W B & EISENBUD, M **Dust Sampler which simulates Upper and Lower Lung Deposition.** *Arch Indust Hyg & Occupational Med* Chicago 1953, Nov, v. 8, No 5, 446–52, 6 figs [Refs in footnotes]

The potential danger of inhaled dust is related to the particle size of the dust. The site of deposition in the respiratory tract is influenced by the size; only the finer dust can penetrate to the alveoli Various workers have studied the deposition of particulate matter in the upper respiratory tract and the retention in the lower lung, and the authors of the present paper show that, despite differences in the method of approach of these various workers, there is considerable agreement in their findings as to the proportion of dust retained

It was desired to design a dust sampler which would separate the airborne dust into two fractions, so that the fraction containing the larger particles would simulate in size distribution that portion of the material which would be retained by the upper part of the respiratory tract

The fractionation of the sample was obtained by using a single unit from a multiple high efficiency

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WRIGHT, B M **The Importance of the Time Factor in the Measurement of Dust Exposure.** *Brit. J. Indust Med* 1953, Oct., v 10, No 4, 235–40 [36 refs]

* See above

† v 11, 379

In discussions of the importance of dust concentrations in the causation of pneumoconiosis, 2 hypotheses of the relative importance of time and concentration have each been widely accepted On the one hand, it is believed that time and concentration are equally important so that the simple average concentration over the period of exposure is the important thing On the other hand, it is believed by many that high concentrations are disproportionately important, that large concentrations, although of only short duration, deserve special emphasis The author discusses the evidence for and against these 2 hypotheses and concludes that there is nothing in our knowledge of the relationship between dust exposure and the incidence of disease, or the mechanism of inhalation and retention of dust, to substantiate the "peak" hypothesis or to conflict with the "average" hypothesis

The effects of this conclusion on the choice of methods of dust sampling and on dust suppression practice are discussed It is suggested that the average concentration should be accepted as the proper index of dust and that this should be measured directly in the most convenient way It should be left to the man on the spot to decide which are the important sources of dust production Belief in the "peak" hypothesis is liable, it is said, to cause some misdirection of energy in dust suppression Thus great stress is laid on the danger arising from such processes as shot firing or the blowing-out of drill holes Without ventilation these processes are certainly an important source of danger, but once ventilation is established the dust thus produced is rapidly diluted and carried away They are then probably less important than some less dramatic processes such as, for example, shovelling, which is carried on for much longer periods *Thomas Bedford*

GÄRTNER, H Ueber die Mengenmessung und

of refs]

The effect upon the lung of the inhalation of dust can be described under three headings In the first group no reaction is produced dust pockets are formed in which the particles lie inertly, and some may be eliminated Under the second heading are classified the dust pneumonias in which an inflammatory tissue reaction is seen These are caused by organisms, although inhalation, probably of special kinds of dust, is necessary in conjunction Predisposition and environmental factors are important and mortality is high though there is a chance of complete cure from an acute attack In chronic infections the irreversible formation of secondary

typical and is caused by the inhalation of dust containing a high percentage of free silica, when the exposure is intense it is associated with early

tissue. This is associated with dust of varied composition, some free from silicon, some containing silicates and some with a small percentage of free silica The transition from harmless lung-dusting to definite disease depends on many factors which are far from being understood Atypical nodules are found in some cases when the dust particles are needle-shaped, as in asbestosis. There is also a transition from diffuse fibrosis to silicosis In general the progression to disease is slower than in silicosis and the incidence is lower. Association with other pathological lung conditions is a complex problem. One wonders if the essential stimulation to lay down fibrous tissue in the case of some dusts is not fundamentally organic, the dust particles acting as catalyst.

These, then, are the effects of dust, this book summarizes the methods which have been used in the attempt to describe dust

The quantity must first be determined, and then the quality Particle size distribution, particle shape and composition are required. Consideration of the act of sampling and of the demands of analytical techniques upon the research worker are necessary. Time must be spared to chase those elusive ideals, the universal dust measuring instrument and the

mode of action, which are important in understanding when to use, and when to avoid, a given instrument. Neither is the flow of particles into the sampling

lung tissue some interesting ways of recognizing particles under the microscope are referred to. These include suppression of contrast in the image of the tissue by mounting in bromobenzol which has about the same refractive index as cytoplasm, staining

with auramine makes particles fluoresce in ultra-violet light, and modifications of dark ground illumination are alluded to. Chemical treatments for the isolation of lung dust are listed.

Finally, some 30 pages are employed to give an account of X-ray diffraction by crystals and its application to mineral analysis, particularly in lung residues.

[The book contains a large number of references which are grouped together at the end. These are well worth having, but their value would be enhanced if they were more specifically associated with the text The treatment of the subject lacks balance but there is a lot of useful information in this volume] *C. N. Davies*

AVY

No 26, 318–32, 11 figs (8 on 4 pls)

This is a general discussion of the various methods and instruments used for measuring dust concentrations, with examples of the techniques used in

quartz particles to agglomerate is large

Many dust-measuring instruments exist Before any limits of dustiness can be established, these different instruments must be compared and calibrated In view of the instability of quartz dusts Avy uses an *indigo test cloud* of average particle size 0 3 micron and as standard instrument the apparatus of SCHULTZ An asbestos filter is used as a secondary standard

Avy thinks it desirable to work with filters, and describes the type of soluble filter developed in ... t in the ... edium is ... ted with ... the filter ... and the ... ed under the microscope

The second part of the paper deals with air pollution ... Dust measurements in chimney stacks are ... of the ... idies of ... source, ... do not ... weather conditions An improved type of ... rument has been developed for this purpose An example is given of measurements of fluorine concentrations in the neighbourhood of an aluminium factory, based on measurements during 7 weeks Interpretation of the results is difficult Although the amount of fluorine deposited can be measured it is not known how much of it is washed away and how much taken up by cattle *via* the vegetation Illustrations of the instruments and micrographs of dust samples are given. *G. Nagelschmidt*

WYNN, A. H. A. **The Assessment of Airborne Dust Concentrations in Mines.** *Safety in Mines Research Establishment.* [Portobello St, Sheffield.] *Research Rept* No 56. 1952, Oct, 26 mimeographed pp, 6 figs (1 on pl) [19 refs] [2s.]

This paper was submitted to the International Labour Office for a meeting on the prevention and suppression of dust in mining, tunnelling and quarrying.

Dust sampling instruments and measuring procedures should provide a numerical result which is approximately proportional to the quantity of dust which may be breathed and retained in the lungs

In Great Britain dust concentrations are assessed either by the counting of particles or by the measurement of stain density. Correctly used, these two methods may be developed to give essentially the same result. Standards of maximum permissible dustiness are in terms of the number of particles per millilitre, of diameter 0·5 to 5 or 1·0 to 5 microns. It is likely that it will be proved possible to count and size particles mechanically, and thus to deal with more samples than at present.

A reasonable standard of routine dust control is being achieved in British coal mines but eventually

Further information is needed about the rates of deposition and dispersion of dust in various circumstances and about the mixing of dust clouds under

LONG, W M **Airborne Dust in Coal Mines: the Sampling Problem.** *Brit J. Indust. Med.* 1953, Oct, v 10, No 4, 241–4

The author is critical of the use of dust-sampling instruments which sample over short periods only The thermal precipitator, for example, collects dust samples over a period of a few minutes and each

of at least a week with the minimum of attention.

usually at the return end, and it is concluded that the appropriate position for the proposed long-period sampling instrument will be the return end of the face *Thomas Bedford*

DAWES, J G, MAGUIRE, B A & TYE, D L **Some Principles of Airborne Dust Sampling.** *Safety in Mines Research Establishment* [Portobello St, Sheffield] *Research Rept* No 102 1954, Aug, 40 mimeographed pp, 16 figs [18 refs] [4s]

appreciated

the source. Fluctuations in dust concentration are large, and either large numbers of short-period

STONE, D E, KANE, L J, CORRIGAN, T E, WAINWRIGHT, H W & SEIBERT, C B **Investigation of a Photo-electric Device for the Determination of Low Concentrations of Dust.** *Bureau of Mines Report of Investigations 4782* Pittsburgh, Pa 1951, Mar 6 mimeographed pp, 6 figs on pls

This device was intended for monitoring a gas in an industrial process in which dust concentration must

centrations are only related to readings on different clouds under special conditions of size distribution.] Transmission of light through each of two tubes, one dust-free and one under test, is detected by photo-electric cells: these are connected in opposition, and the output is amplified to operate an indicator Laboratory (but not industrial) operation is described. *J McK. Ellison*

LAWRIE, W. B, HOLMAN, A. T. & JAMES, E B. **The Observation of Dust in Mines by an Illumination Method.** Reprinted from *Trans Inst. Mining & Metall* London v 63, 145–57, 38 figs. (37 on 8 pls.) (*Bull. Inst Mining & Metall* London 1954, Jan, No 566)

"A new method of illuminating dust of respirable size range, so that it can be both seen and photographed, was recently developed in foundries The present

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included in this paper

"Early results show that dust from holes being drilled by wet percussive drills leaks through the water and into the mine atmosphere. This is true of all tested percussive drills except the wet vented South African type with water at 80–85 p s i., which gives far better dust control than any other type of wet drill tested A dry suction-type drill which extracted the dust through a hollow drill steel gave better dust control than any other system in the conditions of the test. Dry and wet rotary auger drilling were examined and in both cases there was persistent leakage of dust into the general atmosphere from the hole being drilled

"The work on a dry pneumatic pick showed a reduction in the dust cloud when the pick point was embedded in the rock, while the photographs taken on the wet pick indicated that the water supply was too late to wet the first burst of dust

"Both scraper hauling and scraper loading produced dust clouds even on granite which had been lying in a wet bottom for eight months.

"Two attempts were made to photograph the movement of the dust and fumes from blasting, but the atmosphere was too dense to give sufficient contrast for photography It was concluded, however, that dust movements remote from the blast could be photographed and used to indicate dust movement in the mine due to blasting.

"The blowing out of wet drill holes appeared to give dust clouds.

"Finally work was commenced on photographic methods in an effort to avoid the glare produced by large volumes of water from processes involving wet dust control"

HATCH, T. **Developments in the Sampling of Air-Borne Dust.** *Arch. Indust. Health.* Chicago. 1955, Mar., v. 11, No 3, 212–17.

The sampling with analysis of air-borne dust as a measure of hazard arising from inhaling the air sampled is no simple matter. First comes size of dust particles, since none larger than 5 microns reach the alveoli of the lungs where the mischief takes place The most injurious particles seem to be those about

particles which do not penetrate deep into the lungs, and finer particles which do. The author takes for granted that the reader is acquainted with the tech-

being is the only real index of the hazardous nature of any dustiness We are far from accepting any method of dust sampling and analysis which is so fundamental and complete as to have universal capacity for measuring dust hazards *E L Collis*

SPIEGL, C J, LEACH, L J, LAUTERBACH, K E, WILSON, R & LASKIN, S **Small Chamber for Studying Test Atmospheres.** *Arch Indust Hyg & Occupational Med.* Chicago 1953, Sept, v 8, No. 3, 286-8, 1 fig

The authors supply a brief description of a chamber for studying test atmospheres Essentially the apparatus consists of a 5 gallon battery jar (the chamber) into which is blown the vapour The air flow used for vaporizing the liquid is measured by a flowmeter, and the liquid under study is contained in a bubbler The atmosphere concentrations in the chamber are calculated from the loss in weight of the

chloride, iodine, halogenated compounds, aerosols of uranium compounds, sodium chloride and other substances *D G Harvey*

HASENCLEVER, D Grundlagen der betrieblichen Staubmessung **[Fundamentals of Dust Measurement in the Field]** *Staub* Dusseldorf, 1952, Dec 15, No 30, 235-42, 5 figs

This paper gives the content of a lecture in which the well-known difficulties of dust measurements are

in some detail, especially the konimeter in the new (1949) South African version. Operating instructions as used in the author's laboratory for konimeter samples are given *G Nagelschmidt*

MELDAU, R & MEINIG, F. Ein zusammenhängender Satz nichtoptischer Staub-Feinmessgerate. **[A Coherent Set of Instruments other than Optical Ones for Measuring Dusts]** *Staub* Dusseldorf 1953, June 15, No 32, 157-72, 20 figs

Based on the idea that many techniques are required to characterize airborne or accumulated dust, a most heterogeneous series of modern instruments is described which range from electrical microbalances over microtomes to moisture meters, konimeters and an instrument to measure packing density.

G Nagelschmidt

DOLD, H & BROSCHEIT, A. Über die Brauchbarkeit ... ing des ... ngen in ... etrieben ... **in the Estimation of Dust Pollution in the Neighbourhood of Dusty Industries]** *Arch f. Hyg u Bakt* 1954, Oct, v. 138, No. 6, 468-74, 1 fig

The English summary appended to the paper is as follows —

" A concrete example serves to demonstrate how to determine the varying contents of dust in the air in the vicinity of dust dispersing industrial plants Such determinations can be used as the basis for judging the damage claims of occupants in the vicinity of the plant and for the purpose of checking the efficacy of technical improvements that are being installed by dust dispersing industries in order to protect the population from excessive molestation "

HOLT, P. F **The Study of Dusts in Industrial Atmospheres. 1. Determination of the Particle Count.** *Metallurgia* 1951, Mar., v. 43, No 257, 151-2, 3 figs. **2. The Konimeter and Jet Sampling Instruments.** *Ibid*, Apr, No 258, 203-4, 3 figs **3. The Impinger and Cascade Impactor.** *Ibid.*, May, No 259, 258-9, 3 figs. ... *Ibid*, ... Deter- ... Volatile ... o. 261, 52-4, 5 figs **6. Photoelectric Apparatus and Apparatus for the Collection of Large Samples.** *Ibid*, Aug., No. 262, 108-10, 5 figs.

The author reviews the principles and capabilities of the several types of apparatus available for the study of dust problems, and indicates their usefulness in particular investigations. He deals with the thermal precipitator, the konimeter, the jet dust

counter, the impinger, the cascade impactor, the filtration methods (paper, sugar, salicylic acid, naphthalene), and with photoelectric methods of estimating concentration of dust.

The articles should be read in full.

Charles Wilcocks

DALLAVALLE, J M. **Dry Dust Collectors for Industry.** *Heating & Ventilating* 1952, June, v. 49 No 6, 103–10, 6 figs

LJUNGGREN, G & WILNER, T Nife Aerosolindikator ein neues Hilfsmittel für Schnellprüfung des Staubgehaltes der Luft [**The Nife Aerosol Indicator: a New Instrument for Rapid Assessment of the Dust Content of Air**] *Staub* Dusseldorf 1950, Oct 15, No 22, 289–92, 2 figs

This is a German translation of an excerpt from a Swedish paper published in *Teknisk Tidskrift*, 1950, v 80 It describes a small dust-measuring instrument which is in effect a portable ultramicroscope with fixed magnification A motor and fan enclosed in the handle draw the air to be tested through an observation chamber A lamp fed by an accumulator produces, with the aid of a ring-shaped condenser and mirror, a very bright field of light in the path of the air, and a microscope allows observations of this field, the volume of which is of the order of 0 01 cc No direct light enters the microscope, but dust particles scatter the light and thus become visible Large particles form streaks, and smaller ones produce a general luminous haze as the dust-laden air is drawn through the instrument It is also possible to interrupt the flow of air and to estimate dustiness by counting particles that are visible simultaneously On account of convection currents one never sees stationary particles Series of observations can be taken quickly and increase the accuracy of the results

The presence of tobacco smoke can easily be demonstrated and the instrument is intended to be carried about for observation of dust produced at different places in a workshop, or for testing the effectiveness of ventilation or other dust control measures For such work it is a quick and easily portable instrument It is not intended to replace microscopic or gravimetric dust-measuring techniques but rather to be used in conjunction with them

G Nagelschmidt

GOODALE, T C, CARDER, B M & EVANS E C **Dust Particles in High Velocity Air Streams. Representative Sampling.** *Amer Indust Hyg Ass Quarterly* 1952, Dec, v 13, No 4, 226–31, 10 figs

A sampler was needed to obtain from an aeroplane in flight representative samples of finely divided material dispersed in the air at high altitudes There arose major problems aerodynamic considerations of sampling in air streams of high velocity, the development of an efficient precipitator for incorporation in the sampler, and the collection of the samples in such form that the particles would be available for examination by electron or optical photomicrography, autoradiography, and radio-chemical analysis

A sampler was designed that maintained a flow of air into its inlet isokinetic with the flow of the air stream being sampled—isokinetic flow was maintained at air speeds of 125 to 200 miles per hour The inlet is mounted on gimbals and supplied with vanes to maintain alignment with the direction of the wind An electrostatic precipitation unit was devised to be built into the sampler, and the particles are precipitated on to glass slides, electron microscope screens, and selected metallic surfaces

The construction of the samples is illustrated by photographs and drawings, and the tests of efficiency are described

Thomas Bedford

HAMILTON, R J, WAINWRIGHT, T. & WALTON, W H **The Effect of Adhesive Film Thickness on the Sampling Efficiency of the Konimeter.** *Brit J Indust Med* 1951, Jan, v. 8, No. 1, 14–21, 9 figs.

Before dust samples are taken by means of the konimeter an adhesive film is applied to the glass slide In Great Britain the slide is coated with glycerin jelly that is applied with the finger. In South Africa petroleum jelly is applied as a solution in xylene It was felt that the more reproducible results were likely to be got by the latter technique, and an investigation was begun. During the work it was found that the thickness of the adhesive film had a considerable effect on the appearance of a dust sample

The tests confirmed that the use of petroleum jelly in xylene gave results of excellent reproducibility and uniformity, and that the method was better than that in use in Great Britain

Concerning the thickness of the film of adhesive, it was found that thin films of about 0 25 μ thickness, as conventionally used, gave an exaggerated fine-particle count and a low estimate of the number of large particles This was due to the shattering of large particles, and the rebound of such particles, on impact with the slide Films of about 1 μ thickness provided a cushioning effect which largely eliminated those errors

It is suggested that the use of petroleum jelly films 1 μ thick, applied by the solvent method, should be adopted as standard practice

Thomas Bedford

BEADLE, D G **An Investigation of the Performance and Limitations of the Konimeter.** *J. Chem., Metallurg. & Mining Soc. South Africa* Johannesburg 1951, Mar., v. 51, No. 9, 265–83, 6 figs [14 refs]

In a given working place the concentration of air-borne dust varies from time to time, and the variations may be both rapid and substantial. Hence a "snap sample" of the atmosphere may give a misleading impression of the general level of dustiness even if it gives a true indication of the dust concentration at the moment of sampling. The first section of this paper describes experiments in which dust samples were taken with a konimeter at intervals of 10 seconds over a period of 30 minutes or longer. The dust counts so obtained were used to ascertain how accurately the mean of any given number of samples, evenly distributed over a set period, represents the "true mean konimeter count". To ensure that the average is usually within 20 per cent. of the true mean count over a 30-minute period, 15 samples had to be taken. If only 3 samples were taken the mean would occasionally be 50 per cent. too low or 100 per cent too high. The mean of 3 samples taken within 2 minutes is usually not a good measure of the mean dust concentration over a half-hour period, even when dust conditions are fairly steady.

In the second section of the paper there is a study of the efficiency of the circular (Devers) konimeter, the thermal precipitator being used as the instrument of reference. There was no constant factor connecting the dust counts obtained by the two instruments. The ratio of konimeter count to thermal-precipitator count varied from 0·11 to 3 82. The effects on this ratio of the collecting efficiency of the konimeter, of acid treatment, and of the method of counting samples, are discussed.

The collecting efficiency of the konimeter depends greatly on the size distribution and the concentration of the dust sampled, and there is a suggestion that it may be influenced by humidity. With a low concentration of coarse dust the efficiency appears to be high. It sometimes gives higher counts than those yielded by the thermal precipitator, perhaps owing to the breaking down of aggregates or of large particles. With fine dusts the efficiency is low, and it declines with increase of concentration.

Evidence in support of these findings is drawn from the result obtained by other workers.

The konimeter has in the past given valuable service in the gold mines of the Witwatersrand, but the view is expressed that there is now a need for a more accurate instrument for routine dust sampling. A further paper is promised in which such an instrument will be described.

The presentation of the paper was followed by a keen discussion, the account of which should be read.

Thomas Bedford

EHRHARDT, W Zur Methodik konimetrischer Staubzählungen. **[On the Techniques of Evaluating Konimeter Spots]** *Staub.* Dusseldorf 1951, Sept 15, No 26, 333–41, 6 figs

Evaluation of dust counts with the Zeiss konimeter depends on the counting technique. The paper describes and criticizes 3 different methods used in Germany and then recommends a fourth, which is given in detail. It was developed because all other methods are based on counting a portion of the spot and assuming the spot to be circular. The new technique assumes the spot to be an ellipse and strips along the two axes of the ellipse are counted as well as a centre square.

[Unfortunately, the paper only describes the different methods and does not give comparable results of different counting techniques on one and the same spot. Also, the fact that a single konimeter spot is thoroughly unrepresentative of the dust cloud does not appear to be appreciated.]

G. Nagelschmidt

GÜNTHER, Käte Zur Technik konimetrischer Staubmessungen **[The Technique of Konimetric Dust Measurement]** *Deut Gesundheitswesen* 1951, Nov. 22, v 6, No 47, 1357–60, 6 figs

The author describes the technique for using the Zeiss circular konimeter and gives details of certain procedures for improving it.

The konimeter comprises an air pump which can take samples of 5 or 2·5 cc; the air drawn through a fine orifice impinges on a portion of a circular glass plate which is divided into 30 numbered segments, on each of which a separate sample can be taken. The orifice through which the air passes to the plate is guarded by a fine-mesh copper gauze to exclude particles over 50 μ in diameter; this gauze should be examined regularly and renewed if broken. The konimeter chiefly used now has a hand microscope attached, with a micrometer, which enables the dust sample to be inspected as to density, and the amount of the air sample to be adjusted according to the dust concentration.

The surface of the glass plate is treated with an adhesive which may be of gum arabic and glycerin or of mineral oil thinned to the required viscosity with a solvent such as carbon tetrachloride or trichlorethylene. The plates should previously be cleaned with xylol and polished; the adhesive is best applied with a hard flat brush 7 mm broad, the plate being turned during this process; the plates should be used within 10 hours after the application of the adhesive.

Counting of particles is done with an ordinary microscope fitted with an Abbé drawing mirror [camera lucida] so that the particles can be marked on the projected paper. The centre of the dust spot, being the densest part, is divided into four parts for easier counting. The source of light should be neither too strong nor too weak, and an important point is made of cutting off all scattered rays; this is done by passing the light through a light-proof tunnel. The Lumipan microscope is especially suitable. The author uses a special rubber "muff" as a light screen for the condenser. Counting is done in a well darkened room. The microscope stage is fitted with a revolving table to enable each field on the sample plate to be centred. The records required of place, time and conditions of

sampling are those generally made Six photographs and a diagram illustrate the points discussed

E. L. Middleton

DAVIES, C. N, AYLWARD, Mary & LEACEY, Dorothy. **Impingement of Dust from Air Jets.** *Arch. Indust. Hyg & Occupational Med.* Chicago. 1951, Oct., v. 4, No 4, 354–97, 27 figs. [Refs. in footnotes]

This paper may be divided into three parts. (1) An account of tests of efficiency, in relation to particle size and method of use, carried out on various instruments for dust-sampling by impingement from jets (section I—coal dust, section II—silica dust). (2) An account of laboratory experiments on impingement of particles by jets (sections III and IV) (3) A discussion of the theory of impingement, derived from purely physical considerations, in relation to the experimental results (section V).

The dust cloud generator, and the nature of the coal-dust cloud it produced, are described. The instruments tested with coal were (1) Kotzé konimeter, (2) British konimeter, (3) the Owens jet dust counter, (4) Bausch and Lomb dust counter, (5) Cascade impactor, (6) U S. Bureau of Mines midget impinger. The efficiency of each instrument, for any [illegible]

[illegible]

than 0 7 μ diameter was high (often much greater than 100 per cent) but fell off rapidly with increasing diameter so that above about 2 μ diameter it was usually much less than 100 per cent Only the Bausch and Lomb instrument, used with humidification and coated slides, had an efficiency of approximately 100 per cent throughout the range 0 5–10 μ The midget impinger gave consistently high counts owing to disaggregation on impingement under alcohol, so no further measurements were made. The results from the other 5 instruments are interpreted in terms of the design and mode of use of the instrument and the physical processes involved in impingement. It is stressed that the results are specific to the cloud used in most coal mines dusts are coarser and more aggregated, and disaggregation may be even more marked

With quartz dust (particle diameter 0 2–3 5 μ) the Owens, Bausch and Lomb, midget impinger, and Kotzé instruments were tested The use of glycerin jelly was impracticable with such fine transparent particles With the Owens and Bausch and Lomb instruments even with humidification the efficiency was only 10–35 per cent The theoretical efficiency of impaction falls with diminishing particle size, as was observed with the Bausch and Lomb, but with the Owens it appears to rise owing to the shattering of particles at such high speeds of impingement. The midget impinger is very efficient in the range 1–4 μ, but below 1 μ its efficiency falls rapidly. The Kotzé konimeter cannot be humidified and only a few odd particles were detected on the uncoated plate

[illegible]

measured this rises from 0 2 for particles of diameter 0 2 μ to 0 5 for particles of diameter 1·2 μ Finally the theory of impingement as given in detail in another paper (*Proc Physical Soc* Lond B, 1951, v 64, 889) is very briefly discussed and conclusions on instrument design and use are drawn

A number of tables referred to are not included in the paper but are filed at the American Documentation Institute in some instances this makes the [illegible]

[illegible] instruments as such

J McK Ellison

DONOGHUE, J K & MACK, C **The Reduction in Apparent Particle Concentration with Multiple Strokes of the Owens Jet Dust Counter.** [Correspondence] *Brit J. Applied Physics* 1953, Oct, v 4, No 10, 316–17

In sampling cotton-mill dust by the Owens counter it was observed that the apparent concentration per pump stroke diminished as the number of strokes increased The difference proved statistically significant for each of the 7 size groups between 0 46 μ and 5 μ; too few particles larger than 5 μ were present to lead to a conclusion The observed effects are tentatively attributed to the blowing-off noted by DAVIES *et al* [see this *Bulletin*, 1952, v 27, 438], and a simple method of constructing a correction curve, based on certain assumptions and approximations, is suggested.

J. McK Ellison

HASSELT [illegible] INSTITUT D'HYGIÈNE DES MINES. Gén / [illegible] midget [illegible] [Bib- [illegible] mimeo- [illegible]

Simultaneous comparisons were made of the weights of dust caught by a midget impinger and by a Soxhlet filter apparatus, from unit volume of the dust cloud On the average the amount caught by the impinger was about 77 per cent. of that caught by the filter apparatus. Another series of comparisons gave more variable results

* See above

Further experiments were made in which the air passed first through the impinger and then through a thermal precipitator. From the results of these it appeared that all particles larger than about 4 microns in diameter were retained by the impinger. At sizes below one micron the efficiency of the impinger declines rapidly. In terms of the weight concentration of the whole dust the effi-

It is concluded that the thermal precipitator is primarily a research instrument, and that the impinger is of great value for routine dust control work.

Thomas Bedford

BROWN, C E, FISHER, M & BOYER, Florence F **Size of Smallest Particles determined in Impinger Dust-Counting Methods.** *Bureau of Mines Report of Investigations 4802* Pittsburgh, Pa 1951, July pp ii+19 mimeographed, 7 figs. on 6 pls [Refs in footnotes]

This paper describes an experimental investigation of the lower size limit of dust particles detected in counts under light-field microprojector and dark-field microscope conditions. [See also this *Bulletin*, 1946, v. 21, 33.] Experimental clouds of silica and bituminous coal dusts were sampled by impinger, electric precipitator, and (as control) thermal pre-

interpreted as being due to the variation with optical system of the size of the smallest particles detected . with light field, the limit of visibility of

J. McK. Ellison

MAY, K R & DRUETT, H A **The Pre-Impinger. A Selective Aerosol Sampler.** *Brit J. Indust Med* 1953, July, v 10, No 3, 142–51, 7 figs [14 refs]

This device is for use in conjunction with the standard "Porton" impinger, a development of the Greenburg-Smith instrument, it can be used equally for dust counting or for bacteriological aerosol work It intercepts those particles larger than 3½–5 μ, so that only

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drawn off

that both direct impingement and centrifugal force assist the separation The size of the intake hole is adjusted for 50 per cent. retention of 4 μ bacterial particles

range of cut-off available proved to be about 2 25–8 μ The intake efficiency exceeds 95 per cent at all wind speeds for 10 μ

particles up to

troublesome wi

This paper

concerned with the sampling of aerosols

J. McK Ellison

AVY, A., BERNUCHON, A & CARTIER, F Étude comparative des appareils de prélèvement Impingers **[Comparative Study of Dust Sampling Instruments—Impingers]** *Arch. Malad Professionnelles* Paris 1953, v 14, No 5, 469–78, 3 figs

Previous comparisons are outlined and the authors' own work is described In this work the efficiency of various impingement instruments with respect to a standard test cloud was estimated in terms of (1) weight, and (2) number, and the effects of the size of impingement orifice, the distance between orifice and surface of impingement, the velocity in the orifice and the liquid used are studied The dependence of efficiency on size is only mentioned in passing, and the paper confines itself to describing experimental results.

Readers

also to the

Bulletin,

mention

the same ground and formulate general principles concerning impingement samplers

J. McK Ellison

CHAPMAN, H M **Dust Counting by the Most Probable Number Method.** *Arch Indust. Hyg & Occupational Med.* Chicago 1953, Sept, v 8, No 3, 234–45, 10 figs. [Refs. in footnotes]

In the so-called "Most Probable Number" [MPN] method of estimating the density of a bacterial suspension, culture tubes are inoculated with various dilutions of the test suspension, and the number of tubes showing no growth is observed From this information the concentration of bacteria in the suspension can be estimated The author of the present paper has applied this method to the estimation of air-borne dusts, using suspensions of dust collected by the standard impinger technique, and regarding each square of a Whipple disc as a sample tube, so that each square showing no dust is equivalent to a culture tube showing no growth

* v II, 363

† p 297.

The mathematical derivation of the method is outlined, and its accuracy discussed

The method can be used equally well with the microscope or the microprojector With the microscope, and with the standard light field method (U S *Pub Health Bull*, 1935, No 217), the greatest accuracy of estimation is obtained when the suspension contains 150 dust particles per cmm, and with the microprojector the optimum concentration is 600 particles per cmm The best concentration for microscopic examination is rather sharply defined, but with the microprojector concentrations distinctly above or below the optimum it can still be estimated with good accuracy

For 172 cells concentrations were estimated both by the method here described and by direct counting in the ordinary way. On the average the MPN was 90 per cent of the average dust count, and the coefficient of correlation between count and MPN was 0 92 The reliability of estimates was substantially the same by the two methods (coefficient of variation 7 9 per cent for MPN and 6 3 per cent for count)

The time required by the MPN method is only about one-third to one-half that needed for counting by the standard method *Thomas Bedford*

BARKER, C B, O'CONNOR, D T & WINDER, G. E. **Portable Liquid Barrier Equipment for sampling Airborne Dust over Prolonged Periods.** *Safety in Mines Research Establishment* [Portobello St, Sheffield] *Research Rept* No 93 1954, July, 18 mimeographed pp, 1 pl & 9 figs [2s 3d]

The instrument described is in principle, and geometrically, similar to a "midget impinger". It is, however, more robustly constructed and is intended for continuous sampling of mine air over an 8-hour shift in order to obtain samples for determining the composition of air-borne dust The air is drawn through the instrument at 0·1 cubic foot per minute by an aspirator operated by compressed air The liquid used in impingement must be chemically inert and non-volatile, and for this purpose hexyl and benzyl alcohols are suitable In one form the incoming air passes through a size selector (see HAMILTON and WALTON, National Coal Board Central Res Establishment Report No 139, 1952) before reaching the impinger, so that only particles smaller than a given size (determined by selector design and sampling speed) reach the sampler Tests of performance are described Those in the laboratory, in which no size selector was employed, used a thermal precipitator as standard and showed that collecting efficiency fell rapidly for particles smaller than 1µ. In the tests underground two instruments, one of which was equipped with a size selector, were used The interpretation of the effect of the size selector is complicated by disaggregation in the liquid of the trap In long-period samples, however, it was found that the 50 per cent. cut-off diameter of the size selector rose. This is attributed to redispersion of the particles already trapped, and it is shown that if the size selector is tilted and cleaned regularly the rise in cut-off size does not occur *John McK. Ellison*

RANZ, W E & WONG, J B **Jet Impactors for determining the Particle-Size Distributions of Aerosols.** *Arch Indust Hyg & Occupational Med* Chicago 1952, May, v. 5, No. 5, 464–77, 5 figs

The impactor is a device which separates air-borne [illegible]

impactor as an instrument for the assessment of aerosols, and to obtain experimental efficiencies for rectangular and round aerosol jets impinging on flat surfaces

It is shown that with a given set of operating conditions air-borne particles are separated by [illegible]

occurs

The use of jet impactors for determining the particle size distributions of ammonium chloride and sulphuric acid aerosols is demonstrated The cumu- [illegible]

Thomas Bedford

WILCOX, J D **Design of a New Five-Stage Cascade Impactor** *Arch. Indust Hyg. & Occupational Med* Chicago 1953, May, v 7, No 5, 376–82, 4 figs [Refs in footnotes.]

The cascade impactor devised by MAY collects dust particles and grades them according to size in a manner suitable for analysis with light or electron microscopes It collects those particles most likely to shatter, i.e, the larger ones, at low velocities But it is not an absolute instrument. Below a certain size the probability of collection decreases in a rather complex manner. The performance of a jet in the cascade impactor is determined by the effects of the previous stages and the rate of flow through it, as well as by its own physical characteristics. Hence the instrument must be designed as a unit, each stage being compatible with the preceding and following ones

The theory of impaction is briefly outlined in the paper and the design and efficiency of impactors are considered A new 5-stage impactor is described. The smallest jet is 4 05 mm long and 0 290 mm wide The orifice velocity is 1 77 x 10^4 cm per second at the smallest jet and only 2 83 x 10^2 cm. per second at the first and largest jet For material of unit

density the smallest size of particle impacted efficiently by the largest jet is 25 5 microns and that of the smallest jet 0·33 micron.

Several types of heterogeneous groups have been sampled with the 5-stage impactor and the samples were effectively graded according to size.

Thomas Bedford

HASSELT INSTITUT D'HYGIÈNE DES MINES. Gén./221 Communication No. 113 Conimetrie Étude du midget scrubber D.18 **[Dust Measurement. Study of the Midget Scrubber D.18]** [PATIGNY, J. & CARTIGNY, S] 1953, Dec. 28, 54 mimeographed pp., 19 figs

instruments.

ment of the volume sampled The authors do not explicitly subdivide in this manner, but they consider all 5 types of error.

(1) In the size-range below 0 5 micron, near the limit of resolution of the optical microscope, particle counts are subject to wide variations between individuals. The present study is much less thorough than those of C E. BROWN and his associates [see this Bulletin, 1946, v 21, 33, 1952, v 27, 167]

(2) Statistical errors are minimized if each size-range embraces approximately the same number of particles For many actual size distributions this is achieved by employing logarithmic size intervals The authors calculate the error due to two or more particles overlapping but seem unaware of ARMITAGE's more comprehensive paper on this subject (*Biometrika*, 1949, v. 36, 257).

(3) Sampling in liquids increases the number of particles by breaking up aggregates. Moreover, with counting chambers of the depth normally employed, particles suspended in liquid and of diameter less than 1 micron settle extremely slowly. Unless inordinately long settling times are used a considerable proportion

as long as sampling periods are short, but it becomes more so as the time increases

(5) A difference between 2 scrubbers involving a factor of 2 is attributed to the error of measuring the volume sampled.

* v. II, 363 † p 298

By weight, the percentage capture (99 per cent.) is considerably better than that of the midget impinger (97 per cent), the difference being attributed to improved capture of small particles. The instrument is, however, rejected for use in sampling in coal-mines

Many of the points discussed are well known, and

YAFFE, C. D, HOSEY, A D & CHAMBERS, J T., Jr. **The Spiral Sampler—a New Tool for studying Particulate Matter.** *Arch. Indust. Hyg & Occupational Med.* Chicago 1952, Jan, v. 5 No 1, 62–70, 7 figs.

In this instrument particulate matter is collected on a strip of film so that the particles are automatically distributed on the whole according to size. The largest particles are at one end of the strip, and the average

factorily to the uncoated film. From the data so far obtained with the instruments it appears that the separation of dust according to size is good, that almost all particles of diameter larger than one micron are collected, and that good collection is achieved of particles down to half a micron or less

Thomas Bedford

HASSELT · INSTITUT D'HYGIENE DES MINES Gén /179 Communication No 94 Conimétrie Étude comparative des résultats de prélèvements simultanés au précipitateur thermique, au midget impinger et au dé de Soxhlet [HOUBERECHTS, A & CARTIGNY, S] **[Comparative Results of Simultaneous Sampling by Means of the Thermal Precipitator, Midget Impinger and Soxhlet Thimble]** 1952, Apr 4, 17 mimeographed pp, 9 figs on 4 pls

From time to time, over a number of years, simultaneous samples of air-borne dusts in mines have

(T.P), results The

expressed in (1) millions of particles per mgm dust, (2) particles per cc of air, and in the case of the T.P this is also done for the different size fractions In each case comparison of the results obtained with mass concentrations derived from Soxhlet thimble samples gives self-consistent results Direct comparison of midget impinger and T P results, however, shows that even if allowance is made for the differences in sizes counted, arising

from microscopic technique, the midget impinger counts are roughly double the corresponding T P counts with low-ash dusts; with high-ash dusts (ash content >25 per cent) the ratio varied enormously, but had approximately the same mean value The results are interpreted in terms of the properties of the dusts and of the sampling instruments *J McK Ellison*

WATSON, H H **Simplified Eye-Piece Graticule for assessing Thermal Precipitator Dust Samples.** *Brit J. Indust Med.* 1952, Jan, v 9, No 1, 80–82, 2 figs

For measuring the sizes of dust particles an eyepiece graticule is commonly used In examining thermal precipitator records the graticule of Patterson and Cawood has been used for many years The ten comparison circles on this graticule, with a 2 mm objective and suitable tube-length, represent diameters of 0 2 to 5 microns If such a fine classification of particle size is unnecessary, counting and measurement of the particles is made easier by having a graticule with fewer comparison circles, and in this short paper a graticule with circles of only three sizes, representing diameters of 5, 2 and 0 5 micron, is described

There are indications that when the number of particles between 0 5 and 5 microns in diameter is required, the simple counting of the particles between these two sizes is less accurate than when the particles are counted in the four size groups which can be ascertained with the 3-circle graticule

Thomas Bedford

KITTO, P. H & BEADLE, D G **A Modified Form of** [illegible] *J. Chem.,* [illegible] Johan- [illegible] 42 refs.] [illegible]

This paper describes a thermal precipitator (T P) modified to give a selective dust sample, selected in approximately the same way as that deposited in the lungs.

The characteristics required of dust-sampling instruments for routine use in South African mines are outlined, and the drawbacks of those at present available are pointed out. For research work the T.P. is the most satisfactory The instrument described is intended to extend its usefulness to routine work by reducing the skill required for its operation and by being made lighter (2½ lb) and more compact (10 in x 4 in x 2 in) and rapid in use It is also designed to sample selectively in a manner similar to the retention of particles by the lung This is achieved by drawing the dust laden [illegible] clockwork, and the wire of the precipitator head is heated by a miner's cap lamp accumulator. Tests of efficiency are described. This instrument is claimed to have been proved satisfactory under very diverse and exacting conditions in South African gold mines, and also in a South African coal mine

A discussion follows *J. McK. Ellison*

CATCHPOLE, D H J, GREENHAM, R. E & WHITE, E **Airborne Dust: Correlation of Thermal Precipitator with P.R.U. Hand-Pump.** *Trans Inst Mining Engineers* 1953, Jan, v 112, Pt 4, 336–49, 5 figs [12 refs] Discussion 350

The thermal precipitator is accepted in Great Britain as the best available instrument for the sampling of insoluble dusts, but the evaluation of samples is slow and laborious For routine use in the control of air-borne dust in industry a quicker and easier method is highly desirable Some years ago the P R U (Pneumoconiosis Research Unit) hand-pump was introduced for this purpose The sampled air is drawn through a standard paper so that the dust contained by it produces a stain, and the quantity of dust collected is estimated by measuring the optical density of the stain on a densitometer

The P R U pump was introduced in South Wales and there it appears to have given reasonable satisfaction However, in other coalfields difficulty has been encountered in converting the stain density into numerical concentrations of particles As results have been amassed, it has been confirmed [illegible] function 100 $D^{1.4}$ has been calculated and this has been related to the numerical concentration of particles, of sizes 1 to 5 microns, for various collieries and seams, by deriving regression equations

It is recommended that the regression equations should be recalculated from time to time as further routine sampling has been carried out

Thomas Bedford

CEMBER, H, HATCH, T & WATSON, J. A **Dust Sampling with a Rotating Thermal Precipitator.** *Amer Indust Hyg Ass Quarterly* 1953, Sept., v 14, No 3, 191–4, 7 figs

In the thermal precipitator the dust sample is precipitated on the cover slips which are placed alongside the heated wire The particles are precipitated according to size in the direction of the air stream, so that any one microscopic field does not contain

density the smallest size of particle impacted efficiently by the largest jet is 25 5 microns and that of the smallest jet 0·33 micron

Several types of heterogeneous groups have been sampled with the 5-stage impactor and the samples were effectively graded according to size.

Thomas Bedford

HASSELT INSTITUT D'HYGIÈNE DES MINES. Gén./221 Communication No 113 Conimetrie. Étude du midget scrubber D 18 **[Dust Measurement, Study of the Midget Scrubber D.18]** [PATIGNY, J. & CARTIGNY, S.] *1953, Dec. 28, 54* mimeographed pp , 19 figs.

This communication describes a series of tests car-

instruments.

The use of the midget scrubber to determine particle concentration and particle size distribution introduces errors arising from (1) the limited resolution of the optical microscope, (2) statistical errors of counting; (3) errors arising from collecting dust samples in liquids; (4) the use of violent agitation in order to capture small particles, and (5) errors of measurement of the volume sampled The authors do not explicitly subdivide in this manner, but they consider all 5 types of error.

(1) In the size-range below 0 5 micron, near the limit of resolution of the optical microscope, particle counts are subject to wide variations between individuals The present study is much less thorough than those of C E BROWN and his associates [see this *Bulletin*, 1946, v. 21, 33 *; 1952, v 27, 167 †]

(2) Statistical errors are minimized if each size-

1949, v. 36, 257)

(3) Sampling in liquids increases the number of particles by breaking up aggregates Moreover, with counting chambers of the depth normally employed, particles suspended in liquid and of diameter less than 1 micron settle extremely slowly Unless inordinately long settling times are used a considerable proportion of these particles will not be within the depth of focus of the objective at the time of counting The increasing number of small particles counted as time of

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volume sampled.

* v. II, 363 † p 298

By weight, the percentage capture (99 per cent) is considerably better than that of the midget impinger (97 per cent.), the difference being attributed to improved capture of small particles The instrument is, however, rejected for use in sampling in coal-mines

Many of the points discussed are well known, and the discussion of them is apt to be diffuse Nevertheless this report includes an interesting description of the assessment of disaggregation and fracture of particles in the process of sampling *John McK. Ellison*

YAFFE, C. D , HOSEY, A D & CHAMBERS, J T., Jr. **The Spiral Sampler—a New Tool for studying Particulate Matter.** *Arch. Indust. Hyg & Occupational Med* Chicago *1952, Jan , v. 5,* No 1, 62-70, 7 figs

In this instrument particulate matter is collected on a strip of film so that the particles are automatically distributed on the whole according to size. The largest

are removed by centrifugal force which increases progressively along the path An adhesive coating may be used on the film, but dust adheres satisfactorily to the uncoated film From the data so far obtained with the instruments it appears that the

Thomas Bedford

HASSELT: INSTITUT D'HYGIENE DES MINES Gén /179 Communication No 94 Conimétrie Étude comparative des résultats de prélèvements simultanés au précipitateur thermique, au midget impinger et au dé de Soxhlet [HOUBERECHTS, A & CARTIGNY, S] **[Comparative Results of Simultaneous Sampling by Means of the Thermal Precipitator, Midget Impinger and Soxhlet Thimble]** 1952, Apr 4, 17 mimeographed pp , 9 figs on 4 pls

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from microscopic technique, the midget impinger counts are roughly double the corresponding T P counts with low-ash dusts; with high-ash dusts (ash content >25 per cent) the ratio varied enormously, but had approximately the same mean value The results are interpreted in terms of the properties of the dusts and of the sampling instruments *J McK Ellison*

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There are indications that when the number of particles between 0 5 and 5 microns in diameter is

KITTO, P. H. & BEADLE, D G **A Modified Form of Thermal Precipitator.** Reprinted from *J Chem, Metallurg & Mining Soc South Africa* Johannesburg. 1952, June, 284–306, 11 figs [42 refs] Discussion 307–11, 3 figs

This paper describes a thermal precipitator (T P) modified to give a selective dust sample, selected in approximately the same way as that deposited in the lungs

The characteristics required of dust-sampling instruments for routine use in South African mines are outlined, and the drawbacks of those at present available are pointed out. For research work the T P is the most satisfactory The instrument described is intended to extend its usefulness to routine work by reducing the skill required for its operation and by being made lighter (2½ lb) and more compact (10 in. x 4 in x 2 in) and rapid in use. It is also designed to sample selectively in a manner similar to the retention of particles by the lung This is achieved by drawing the dust-laden

clockwork, and the wire of the precipitator head is heated by a miner's cap lamp accumulator Tests of efficiency are described This instrument is claimed to have been proved satisfactory under very diverse and exacting conditions in South African gold mines, and also in a South African coal mine

A discussion follows. *J. McK. Ellison*

CATCHPOLE, D H J, GREENHAM, R. E & WHITE, E **Airborne Dust: Correlation of Thermal Precipitator with P.R.U. Hand-Pump.** *Trans Inst Mining Engineers* 1953, Jan, v 112, Pt 4, 336–49, 5 figs [12 refs] Discussion 350

The thermal precipitator is accepted in Great Britain as the best available instrument for the sampling of insoluble dusts, but the evaluation of samples is slow and laborious For routine use in the control of air-borne dust in industry a quicker and easier method is highly desirable Some years ago the P R U (Pneumoconiosis Research Unit) hand-pump was introduced for this purpose The

densitometer

The P R U pump was introduced in South Wales and there it appears to have given reasonable satisfaction However, in other coalfields difficulty has been encountered in converting the stain density into numerical concentrations of particles As results have been amassed, it has been confirmed

value as one moves from seam to seam, or even from colliery to colliery where the same seam is mined No attempt has been made to establish the exponent for individual seams and collieries Instead the function 100 $D^{1.8}$ has been calculated and this has been related to the numerical concentration of particles, of sizes 1 to 5 microns, for various collieries and seams, by deriving regression equations

It is recommended that the regression equations should be recalculated from time to time as further routine sampling has been carried out

Thomas Bedford

CEMBER, H, HATCH, T & WATSON, J A **Dust Sampling with a Rotating Thermal Precipitator.** *Amer Indust Hyg Ass Quarterly* 1953, Sept., v. 14, No 3, 191–4, 7 figs

In the thermal precipitator the dust sample is precipitated on the cover slips which are placed alongside the heated wire The particles are precipitated according to size in the direction of the air stream, so that any one microscopic field does not contain

a random size distribution, and size measurement must be made across the entire deposit. This paper describes a method for obtaining a uniformly dispersed dust sample by rotating the collection plate A full description of the apparatus is given

Because of the rotation of the collecting plate, the density of particle disposition decreases as the distance from the centre of reduction increases

The particles are randomly distributed with respect to size, and the instrument is small, mechanically simple and easy to use *Thomas Bedford*

ZEBEL, G. Vergleichende Messungen an feinteiligen Aerosolen zwischen Thermalpräzipitator und Spaltultramikroskop. **[Comparative Measurements on Aerosols of Fine Particles with a Thermal Precipitator and a Slit Ultramicroscope]** *Staub* Dusseldorf. 1955, Mar 15, No 39, 21-9, 7 figs

Counts of the number of particles per cc were made on an aerosol containing particles of dried Indian ink between 0 5 and 5 microns in diameter A slit ultramicroscope with STUMPF's method (*Kolloidzschr*, 1939, v 86, 339) was used as a standard of reference for thermal precipitator determinations The latter instrument was of Walkenhorst's design with a ribbon-heating element. on one side of this the usual cover slip, backed with solid metal, was fitted and on the other a perforated electron microscope diaphragm coated with a collodion film

Electron microscope counts were made of particles collected simultaneously on the collodion film and on a Formvar [polyvinyl formaldehyde plastic] film stripped from the cover slip (technique of CARTWRIGHT and SKIDMORE. p 312)

The *stripping technique agreed on the average* [illegible]

from the exposed parts of the film [The conclusions would have been more valuable had the author confirmed that the air flow was the same on both sides of the heating element in the thermal precipitator] *C N Davies*

HOSEY, A D & JONES, H H. **Portable Electrostatic Precipitator operating from 110 Volts A.C. or 6 Volts D.C.** *Arch. Indust. Hyg & Occupational Med* Chicago 1953, Jan., v 7, No 1 49–57, 6 figs

For many years electrostatic precipitators have been used for sampling air-borne dusts The authors describe a modified instrument which has 4 special features It collects samples on either glass or metal slides, it has a new type of sampling head, it operates either from 110 volts A C or 6 volts D C , and the unit is light in weight and can be carried conveniently from the shoulder. The new sampling head is transparent, thus permitting visual observation of the sample while it is being collected, and it has a built-in flowmeter.

In most instances sufficient material for chemical analysis or microscopic examination can be collected in a short period with an airflow of 1 cu ft /min , but this rate of flow does not give complete efficiency of collection when glass slides are employed With these slides 100 per cent efficiency can be got, with a rate of flow of 0 5 cu ft /min Constructional details of the sampling heads are given

The power input supplies 60–100 ma at 300–400 volts A C. but a 15 kv. radio frequency coil and a variable resistor permits delivery of 8–13 5 kv. D C [illegible]

MORLEY, M J. & TEBBENS, B D **The Electrostatic Precipitator—Dilution Method of Flow Measurement.** *Amer. Indust. Hyg. Ass Quarterly* 1953, Dec , v 14, No 4, 303–5, 3 figs.

The accurate measurement of air flow through an electrostatic precipitator of the type used for air sampling is found to be difficult owing to the disturbance of the normal flow pattern by the introduction into the air stream of an additional instrument such as a rotameter The technique described is said to have no significant effect upon the flow pattern

The precipitator assembly is used as a suction source to draw room air through a 15 cu ft stainless steel tank containing a mixture of air and CO_2 Continuous mixing is achieved by the use of an electric fan Samples of the mixture are taken at regular intervals, and analysed by means of an Orsat apparatus, the flow rate then being determined from the rate of dilution of CO_2 Results are found to be reproducible within 4 per cent. *David E Hickish*

LAUTERBACH, K E., MERCER, T T , HAYES, A D & MORROW, P. E **Efficiency Studies of the Electrostatic Precipitator.** *Arch Indust. Hyg & Occupational Med* Chicago 1954, Jan , v. 9, No 1, 69–75, 2 figs

In connexion with studies of the inhalation of radio-active materials, it is necessary to know (a) the radio-activity, and (b) the main particle size of both inspired and expired aerosols In the necessary sampling, the electrostatic precipitator will be used because of its size collection efficiency and low resistance to the flow of air. This paper describes an investigation of the efficiency of the electrostatic precipitator in collecting radio-active particulate matter under conditions very similar to those used in the normal tests

The experimental results show that the electrostatic precipitator allows only a very small penetration of air-borne radio-active material With rates of flow of

8–23 litres per minute, and mean particle sizes of 0 2–0 7 micron, the average amount of material escaping collection was only 0 02 per cent. With particles of 0 7 micron median diameter, a sampling rate of 15 3 litres per minute, and a concentration of 5 4–7 7 mgm per cubic metre, penetration was only 0 002 per cent *Thomas Bedford*

BEADLE, D G, KITTO, P. H. & BLIGNAUT, P. J. **Portable Electrostatic Dust Sampler with Electronic Air Flow.** *Arch Indust Hyg & Occupational Med.* Chicago 1954, Nov, v. 10, No 5, 381–9, 7 figs.

An instrument was designed to yield large dust samples for gravimetric or compositional analysis. Dusty air is ionized in a chamber in which a corona [illegible]

needed even in stagnant air, the effect of the geometry of the ionizing chamber and its operating current on the air velocity has been investigated With an operating current of 400 μA at 12kV an air velocity of 40 cu ft /min is obtained, at this velocity the efficiency of collection (based on a number count, in comparison with the thermal precipitator) is given as about 93 per cent. At 100 cu ft /min the *mass* efficiency is approximately 90–95 per cent The efficiency falls off for particles below about 2 microns in size.

The apparatus consists of the collecting cell and a power pack, operated from either mains or batteries, which supplies the high potentials for ionizing chamber and collector The batteries have a normal life of 12–15 hours before recharging is necessary The whole equipment weighs 42 lb *R L Gordon*

BROOMHEAD, G & BURDEKIN, J T **A Study of the Leitz Tyndallometer.** *Safety in Mines Research Establishment* [Portobello St, Sheffield] *Research Rept* No 61 1953, Feb, 37 mimeographed pp, 14 figs [13 refs] [2s 3d]

The authors compare measurements of air-borne [illegible]

based on thermal precipitator samples The conclusions drawn are based on statistical arguments

For dusts from any one source the correlation coefficients between Tyndallometer readings and each of the other measurements are high and significant The regression coefficients and the scatter of individual readings about the regression lines vary widely, and depend on the source of dust The calculation of dust concentration from Tyndallometer readings, with these regression lines, is then outlined, and the error due to the scatter of the experimental points about the regression line is quoted [In correspondence with the reviewer one of the authors (Broomhead) apologizes that σ is incorrectly stated to be the standard [illegible]

instance it is 93 per cent. for the gravimetric concentration, and in another 63 per cent for the numerical concentration and 70 per cent for the surface area. At concentrations below the mean used in calibration the percentage errors will therefore be very large indeed

These results are discussed in relation to those of WYNN and DAWES (*Safety in Mines Research Establishment Research Rept* No 28, 1951) and also in [illegible]

would have fallen below the light beam, the correlations with the number and surface area of particles below 5 μ was not as high as those of the unsettled clouds This anomaly was not further investigated

In conclusion, the authors state that the instrument is easy to operate once set up, and after calibration against a thermal precipitator is useful for measuring rapidly fluctuating dust concentrations On the other hand, it will give spurious readings if fumes or mists from mine operations are present, and is too heavy and cumbersome for routine work Various modifications are suggested

In an appendix by M BEREK, K MANNCHEN and W SCHÄFER (of the Physical Laboratories of the company manufacturing the instrument) a laboratory calibration of the Tyndallometer using a number of different dusts ground to the same degree of fineness is described Highly consistent results were obtained The instrument is also described and instructions for its use are given

[This paper gives a valuable assessment of trials of the Tyndallometer, but is too detailed to be of general interest The statistical material is largely presented in terms of statistical parameters and constants. It would help the layman if the conclusions drawn from them were clearly stated, and their implications and limitations outlined] *J McK Ellison*

HOLT, P F. & CHALK, A J. **New Method for monitoring Air-Borne Dust.** *Arch Indust. Hyg & Occupational Med* Chicago. 1953, May, v 7, No 5, 404–10, 8 figs

The authors needed a readily portable instrument

capable of evaluating rapidly large numbers of dust samples For the purpose they developed a technique which combines a volatile filter method of sampling with a photo-electric method for the evaluation of the samples. The sample is collected by drawing air through a filter consisting of a compressed pad of an organic substance and the pad is then suspended in an organic liquid. The concentration of the suspended particles is recorded by a simple photo-electric instrument This method permits of a higher concentration of dust in the liquid and so enables the scattered light of the Tyndall beam to be measured with a relatively insensitive instrument.

native filter material where large volumes must be sampled is dimethylterephthalate.

For a given dust, *e g*, crystalline silica, the relationship between the nephelometer reading and the relative dust concentration is linear. If the dust is silica, the refractive index of the suspending medium must be very different from that of silica A suitable solvent is acetone With a mixed dust cloud, *e g*, of crystalline silica and carborundum, a suitable choice of medium will enable one component of the dust to give a maximum nephelometer reading, while other components are suppressed It is obvious that calibration of the dust must be carried out with dust of the same constitution as that subsequently to be examined A feature of the method described is its ease and speed Highly skilled persons are not needed and a sample may be evaluated in about one minute

Thomas Bedford

WOOLRICH, P. F **A New Electrostatic Sample Collector permitting Direct Microscopic Examination.** *Amer Indust. Hyg Ass Quarterly* 1954, Dec., v. 15, No. 4, 267–8, 1 fig.

LLOYD, H. **The S.M.R.T.B. Cap-Lamp Densitometer.** *Ministry of Fuel and Power. Safety in Mines Research & Testing Branch Res. Rep. No 6* 1950, May, 6 pp., 4 figs.

For the rapid sampling and estimation of air-borne

mine

The instrument consists of a photo-electric densitometer weighing only a few ounces, and it operates from the light given by an ordinary miner's cap-lamp. The filter-clip from the hand-pump is inserted into a slot in the densitometer, and light from the lamp passes through the filter paper before falling on to the surface of the photoronic cell The cell is connected to a low-resistance micro-ammeter

compared with the underground estimations, and this

Thomas Bedford

DAWES, J. G. **The Intercept Length Method for the Automatic Evaluation of Dust Samples.** *Safety in Mines Research Establishment.* [Portobello St., Sheffield.] *Research Rept.* No. 54. 1952, Nov., 29 mimeographed pp., 17 figs. [12 refs] [2*s*.]

The counting of dust particles by conventional microscope methods is a long and laborious business, and the consistency of the results so obtained is by no means perfect. From time to time attempts

impulses generated when a scanning element intercepts and passes over a particle or its image in the field of view.

This last method has been used by the author, who in this paper develops for two special cases a general theory for interpreting the intercept-length distribution in terms of the concentration and size-frequency of particles.

To test the theory, photomicrographs of portions of a dust sample from an airway in a coal mine were used. The distributions deduced from the results of scanning were compared with those obtained by conventional microscopy, and there seemed to be no significant difference between the results

Thomas Bedford

DAWES, J G. **Handpump Sampling in Coal-Dust Clouds: Optical Density Method.** *Safety in Mines Research Establishment* [Portobello St, Sheffield] *Research Rept* No 83 1954, Jan, 24 pp, 16 figs [11 refs] [1*s* 6*d*]

The coal dust stains on filter paper which are obtained by the hand-pump method of sampling are interpreted by the application of an empirical equation Inconsistencies arise which cannot be explained satisfactorily by postulating effects due to variations in the dust clouds sampled, and the author here examines the problem of interpreting stain density in

experiments lead him to advocate the use of an esparto filter paper

For interpreting the optical density of the stain a new equation based on a theoretical formula is given, and this has been tested and found adequate. Variations in the calibration factor, which were substantial by the earlier method of reckoning, are far smaller when the new equation is used.

One appendix to the paper gives some information about the variations in dust clouds in mines, and another describes some results obtained underground with the new filter paper and the new equation

Thomas Bedford

DAWES, J G **Densitometric Evaluation of Coal-Dust Stains on Filter Paper.** Reprinted from *Brit J Applied Physics* 1954, June, v 5, 221–4, 5 figs

Previous workers (DAVIES and AYLWARD, *Brit J Applied Physics*, 1951, v 2, 352) discussed the photoelectric measurement of coal-dust stains on filter paper, and gave formulae for interpreting the light-screening power of deposits of coal-dust collected on different types of filter paper They suggested that their basic formula was adequate for the two finest clouds used by them, but that an empirical correction should be made when the formula was used for coarser clouds The present paper records new results which are used to examine the theory of the earlier workers and proposes a development of the theory to account for some discrepancies that are observed

The original paper should be consulted by those interested *Thomas Bedford*

HAS [illegible]

[14 refs]

[illegible]

particles can be deduced The authors present the results of a study of the application of this method and confirm an equation for the estimation of dust concentration previously put forward by DAWES [see this *Bulletin*, 1955, v 30, 605]

If the estimation of the dust hazard is to be sufficiently exact it is necessary to avoid catching particles of larger than respirable size, to aspirate the sampled air at a constant speed, and to use an adequate filter paper. These points are examined in detail.

* p 304

In applying the hand-pump technique errors may arise from a variety of causes The authors conclude [illegible]

in the apparatus for routine dust-control work, for extensive control implies a great many samples and a considerable amount of work in the laboratory.

Thomas Bedford

CHAMBERS, L A **Filter Media for Air Sampling.** *Amer Indust Hyg Ass Quarterly* 1954, Dec, v 15, No 4, 290–96 [12 refs]

The media discussed are those which function [illegible]

physical properties and chemical compositions of the [illegible]

QUI[illegible]

[illegible]

examined under the microscope, and the size distribution of the dust is thus ascertained

The operations required in the laboratory include the following First, the tetrachloronaphthalene filter is dissolved in benzene, and the solution is twice centrifuged and decanted to collect the dust. Then the particles are made wettable by "peptization", by which they are covered with gum arabic. Sedimentation in distilled water follows—three fractions are obtained:—(1) particles larger than 20 microns in diameter, (2) particles of 5 to 20 microns, and (3) particles of less than 5 microns diameter. For the microscopic examination a magnificat[illegible]

500 times is employed. Separate counts are made of particles of coal and of other minerals.

With a sufficiently large sample chemical and

its overall dimensions are 40×20×10 cm. (about 16×8×5½ in.). *Thomas Bedford*

WRIGHT, B. M. **A Size-Selecting Sampler for Air-borne Dust.** *Brit. J. Indust. Med.* 1954, Oct., v. 11, No. 4, 284–8, 4 figs. [18 refs.]

A compressed air ejector is used in conjunction with ... orifice to draw 100 litres per minute of air

porates

50 per

5μ, at

rable"

fraction of an air-borne dust will be collected in the thimble. In coal dust clouds averaging 850 particles/ml. (1.0–5.0 μ), about 1 gm. of dust is collected over an 8-hour shift. The sampler has a total weight of 10 lb.

The performance of the elutriator was tested with a cloud of mono-disperse glass spheres varying in size up to 15μ (density 2.25), and results compare well with the theoretical curve for 50 per cent. cut off at 3.3μ diameter (equivalent to 50 per cent. at 5μ for unit density). Loading of the elutriator plates with coarse dust did not affect the cut-off size. A deviation from the horizontal of 5° produces an increase in cut-off size of only 0.2 per cent. *D. E. Hickish*

FIRST, M. W. & SILVERMAN, L. **Air Sampling with Membrane Filters.** *Arch. Indust. Hyg. & Occupational Med.* Chicago. 1953, Jan., v. 7, No. 1, 1–11, 4 figs.

Molecular or membrane filters have been known for some years but have only recently been produced commercially. They have already been used for bacterial sampling and this paper describes their use ... air-borne dusts

... membrane of about

... from one of several

... are very porous, with a pore volume of 75–80 per cent. of the volume of the filter, and contain tubular openings which are smaller at the upstream face than at the other. The size of the pores can be controlled in the manufacturing process and some filters are nearly 100 per cent. efficient for particles smaller than 0.1 micron in diameter. The filters rapidly acquire a high electrostatic charge but it is not certain how important this charge is in the separation of particles. It may be a major factor in filters of high porosity. Resistance to the flow of air is high. Separation is mainly achieved by sieving and by electrostatic precipitation, and therefore particles are retained at or very near to the filter surface.

These filters have an index of refraction close to 1.56. When immersed in an oil of this refractive index, the filter becomes transparent to transmitted light and the deposited material can be examined microscopically *in situ*. Particles are deposited on the surface in the same state as that in which they were suspended in the air or gas. With a suitably sparse deposit, the size and number of agglomerates can be estimated as well as the particle parameters of the material.

The filter-holder and air-sampling equipment are described. For many applications an adequate sample can be collected with a hand pump. Transport of samples is easy and a holder 2 in. in diameter and 3 in. long will hold 12 samples.

Three types of membrane filters, depending on pore size, are described as hydrosol assay, aerosol assay and aerosol protective. The hydrosol assay type has a pore size of about 0.1–0.3 micron, and with 1 in. of mercury pressure the velocity of flow is 7–10 ft./min. The aerosol assay type has a pore size of 0.5–0.7 micron and a velocity of 24–33 ft./min. The aerosol protective type has the larger pore size of 1.2–1.6 microns and a velocity of flow of 115 ft./min.

Comparative dust counts obtained from samples collected on membrane filters and with the midget-impinger show that similar counts are yielded by the two types of sample and the use of the filters results in an appreciable saving in time, labour and equipment. Acid mists and metal fumes may be collected at nearly 100 per cent. efficiency.

... of membrane

microscopy needs further investigation.

Thomas Bedford

BURKE, W. C., Jr. **Size Determination of Silica Particles collected on Membrane Filters.** *Amer. Indust. Hyg. Ass. Quarterly.* 1953, Dec., v. 14, No. 4, 299–302, 3 figs.

A membrane filter is used to collect samples of air-borne dust, and is subsequently dissolved in a solvent containing 40 per cent. Cellosolve and 60 per cent. acetone, 40 ml. of solvent being used for a 47 mm. filter. Similar filters of the same size are found in practice to vary but slightly in weight, and the resultant solution is taken to have a standard viscosity of 0.740 centipoise and density of 0.860.

The dust suspension is then poured into a sedimentation cell, and a turbidimetric analysis performed, based on a 1.25 cm. fall. The subsequent calculations are fully described in the paper by means of a worked example.

The method may be used when 5 mgm. or more of dust can be collected, and the results are not affected by variations of the quantity collected from 5 mgm. to 24 mgm. Results obtained when the silica dust is collected on a membrane filter compare well with those obtained when a sample of the same dust is

suspended in xylene Good agreement is also obtained with size analysis by filar micrometer.
David E. Hickish

FRASER, D. A. **Absolute Method of Sampling and Measurement of Solid Air-Borne Particulates. Combined Use of the Molecular Filter Membrane and Electron Microscopy.** *Arch. Indust. Hyg. & Occupational Med.* Chicago 1953, Nov, v 8, No 5, 412–19, 7 figs.

Molecular filter membrane provides a sampling medium for aerosols with a collecting efficiency that approaches 100 per cent and with a performance independent of and unmodified by the size of the particles or their state of aggregation. The method here described employs a molecular filter membrane with its high efficiency in combination with the electron microscope for high resolution, thus obtaining what is claimed to be an absolute procedure for the analysis of particle size. The three steps in the procedure, each of which is described in detail, are (1) collecting a sample of the airborne material on a molecular filter membrane; (2) effecting transfer of the particles to a prepared electron microscope specimen screen and photographing the particles, and (3) determining the size distribution of the particles by visual measurements from their projection on a screen.

Particle size distributions obtained by this method and by standard optical techniques are compared critically. *Thomas Bedford*

EINBRODT, H. J & MAIER, K H Staub-Mikroskopie mit Membranfiltern **[Dust Microscopy with Membrane Filters]** *Staub* Düsseldorf 1954, June 15, No 36, 264–70, 6 figs

Membrane filters may be made transparent with liquid of appropriate refractive index, and after special preparation (of which details are given) they are suitable for gravimetric work. The authors claim, as advantages over previous methods, the smaller amount of sample needed, the good adhesion of sample to membrane (even if oil immersion is used), better dispersion of the sample, and modest equipment costs *R L Gordon*

LLOYD, H, WINDER, G E & GILLARD, D A **An Automatic Dust Sampler.** *Safety in Mines Research Establishment* [Portobello St, Sheffield] *Research Rept* No 29 1951, Aug., 19 mimeographed pp, 11 figs & 1 chart [1s]

Surveys of air-borne dusts call for the use of various types of apparatus This paper describes an instrument which automatically collects filter stain samples of air-borne dust underground over frequent consecutive intervals The samples are rapidly evaluated on the surface by means of a densitometer, without the need for highly skilled persons. [illegible]

The motive power is provided by low-pressure compressed air controlled by clockwork.

[illegible]

DAWES, J G, HOWARTH, S R. & SLACK, A **Trials with an Experimental Long-Period Sampler for Airborne Dust.** *Safety in Mines Research Establishment* [Portobello St, Sheffield] *Research Rept* No 87 1954, Feb, 19 mimeographed pp., 10 figs [18 refs] [1s 3d]

A constant-head water aspirator is used to draw the dust cloud through a horizontally held filter paper of 0·48 cm diameter with a flow rate of 1·25 cc per minute The upward vertical linear velocity of the air drawn to the filter was 0·117 cm. per second, corresponding to the terminal velocity of a spherical particle of unit density and diameter 6·25 microns.

For purposes of the tests 2 sampling heads were mounted side by side in the dust tunnel and hand-pump and thermal precipitator samples were also taken for comparison Incremental sampling was made at half-hour intervals until a sample equivalent to a 5-hour sampling period was obtained. Air speeds of 100 ft./min and 400 ft/min were used

When coal dust alone was being sampled, Tullis Russell Esparto No 10 filter paper was used, and the samples were evaluated by means of an optical densitometer There was no significant difference between the performance of the instruments in air streams of 100 ft/min. and 400 ft./min The correlation between the densitometer parameter S and the product of volume sampled and dust concentration was good, and the sensitivity of the system adequate. The densitometric evaluation of a sample required less than 5 minutes

For clouds of mixed dust, Whatman No 1 filter paper was used, and evaluation was made by the air-flow resistance method, for which a new form of air-flow resistance meter had been devised The moisture content of the filter papers was standardized

as far as possible The correlation between total quantity of dust collected in a given time and the estimated mean concentration during that time was good. Evaluation of a sample with the resistance meter required about 4 minutes.

Consistency of results between the 2 long-period samplers was rather better with densitometric evaluation than with the air-flow resistance method, but it appears that neither method results in more inaccurate sampling than is obtained with the handpump or thermal precipitator under similar conditions

D. E Hickish

JOOS, E Neues Verfahren zur Entfernung von Staubproben aus Papierfiltern **[A New Method for the Removal of Dust Samples from Paper Filters]** *Staub* Dusseldorf 1954, Mar 15, No 35, 35–8, 4 figs.

In dust-sampling studies it is often desirable to remove the dust collected as completely as possible from a piece of filter paper The present note describes a little piece of apparatus designed to effect this removal It consists in essence of a superstructure which can be fitted to a suction flask This structure consists of a metal cylinder, open on top, which can be screwed to a conical receiving filter A wire cage is placed inside the cylinder, the piece of paper is folded over the wire cage, dusty side downward, and then the cylinder is filled with the washing liquid This liquid is next sucked through the apparatus and, in passing through the dust filter from the clean side towards the dirty one, it removes the dust completely. Size distribution curves show the dust retained after dry tapping but removed by this washing technique to be considerably finer than the bulk of the dust. A similar dry method based on sudden vacuum release is less effective

G. Nagelschmidt

SEHL, F. W. & HAVENS, B. J., Jr. **A Modified Air Sampler employing Fiberglas.** *Arch Indust. Hyg. & Occupational Med.* Chicago. 1951, Jan, v. 3, No. 1, 98–100, 2 figs.

Earlier dust sampling appliances in which glass-wool was used as a filtering medium have not been altogether successful in industrial use. This paper describes a sampler which employs glass-wool (Fiberglas) with a controlled packing density. It is acid-resistant, will retain fumes as well as dust, [illegible] … a filter … r The … imeter. … bres of … Three … en the … y, the … ite at a

Tests were made with fresh ammonium chloride fumes, and the sampler was found to have an efficiency of practically 100 per cent It is thought that the apparatus can be made equally efficient for almost any particulate matter—dust or fume Its use is limited to those instances in which chemical analyses are intended. Other tests with lead fumes also gave satisfactory results.

The sample can be sealed immediately after it has been taken

Thomas Bedford

HOLT, P F **The Determination of the Mass Concentration of Air-Borne Dusts: an Electrical Sampling Pump for Use with Volatile Filters.** Reprinted from *Trans. Inst Mining & Metall.* 1951–52, v. 61, Pt. 1, 15–20, 5 figs. (1 on pl)

This instrument is intended for measuring mass concentration of dust under industrial conditions The sampling pump described draws a known volume …

… warmed up, and varied by 3 per cent with filter compression Measurements on an artificial cloud of approximately constant size distribution (median size 1·7μ–2 2μ · 97·5 per cent $<10\mu$) and varying concentrations gave good agreement between mass concentration and thermal precipitator count The effective size-range sampled is not given

J McK. Ellison

BANGERT, F. *Probleme der Feinstfiltration von Aerosolen.* **[Problems of Ultimate Filtration of Aerosols]** *Staub.* Düsseldorf 1951, June 15, No. 25, 158–71, 14 figs

Fine dusts are defined as having a particle size below 3 to 5 microns They are important as a health hazard but they are difficult to filter. Usually a coarse filter will be used in front of a fine one in order to prolong the useful life of the latter

In order to assess the efficiency of a filter it is necessary to have a test cloud. An apparatus developed in Germany during the war is described. … (TCP) with …

In general, filtering efficiencies of one part in 10,000 are adequate, but in the photographic industry and in penicillin manufacture, for instance the requirements are much more stringent

Similar measurements can be carried out with the portable Leitz tyndallometer, if two instruments are used side by side

The materials used for making fine filters are briefly discussed on the basis of experience gained with dust respirators Filtering efficiencies of cotton and wool alone and mixed with asbestos, resin and other materials are given in a table. The physical processes underlying filtration are briefly discussed and illustrated by micrographs *G Nagelschmidt*

AVY, A P. Staubprobenahme mit Hilfe eines löslichen und verdampfbaren Filterpapiers **[Dust Sampling with a Soluble and Volatile Filter Paper]** *Staub.* Dusseldorf 1954, Sept 15, No. 37, 372–81, 8 figs

The filter material is a mixture of tri- and tetrachlornaphthalene, which melts at 85–90°C., boils at about 300°C, is easily soluble in benzene, carbon tetrachloride, ether and acetone, but is completely insoluble in and unwetted by water. In commercial form it may contain up to 25 p p m. of dust and must be distilled before use as a dust-sampling material, techniques are described for its distillation and for the preparation of filters. Brief details are given of a suitable routine sampling instrument. Samples may be evaluated gravimetrically, chemically or by direct particle counting The filters are mechanically strong, and have a high and quantitative efficiency of dust collection for particle sizes greater than 0 5 micron *R. L. Gordon*

PFEFFERKORN, G & PORTHEINE, F Eine vereinfachte Pipettanalyse als Schnellmethode zur Bestimmung der lungengängigen Staubanteile **[Simplified Pipette Analysis for Rapid Determination of Respirable Dust]** *Arch f Hyg. u. Bakt.* 1950, v. 133, No 1, 79–87, 3 figs

The upper size limit of respirable dust is of the order of 5 microns and the proportion of material below that size in any given powder can be determined by pipette analysis. The paper describes a number of modifications, chiefly to make the method cheaper and simpler and suitable for routine analysis, especially of limestone used for stone dusting

If 10 gm of dust are suspended in 1 litre of water and a sample of 10 ml [illegible] dept [illegible] in [illegible] by [illegible] weight of the material is of the order of 2 7. The authors recommend the use of a syringe fitted with a needle of about 0 9 mm. diameter to replace the expensive pipette analysis apparatus Lumbar puncture needles are said to be very suitable.

The [illegible]

G. Nagelschmidt

ANDREASEN, A H M. Über die Bestimmung der Feinheit staubformiger Stoffe durch die Pipettemethode **[The Determination of Fineness of Powdered Materials by means of the Pipette Analysis]** *Staub* Dusseldorf 1954, Mar 15, No 35, 11–17, 4 figs

This is a short review of the scope and technique of pipette analysis in very general terms The author rightly stresses the importance of complete deflocculation and gives some methods for checking this The addition of ½ per cent sodium linoleate is recommended for coal and soot analyses in water, isobutylalcohol is recommended for dispersing sugar, and cyclohexanol for metals and water-soluble salts.
G Nagelschmidt

JOOS, E Richtlinien fur die Bestimmung der Kornungskennlinien von Stauben durch die Sedimentationsanalyse nach Andreasen **[The Determination of the Size Distribution of Dusts by Sedimentation (Pipette) Analysis according to Andreasen]** *Staub* Dusseldorf 1954, Mar 15, No, 35, 18–34, 11 figs

Th[illegible] of [illegible] ar[illegible] im[illegible] An[illegible] material discussed, such as the derivation of Stokes's law, a description of how to measure true densities with a vacuum pycnometer and how to carry out [illegible] mixture is recommended of 50 per cent butylene glycol and 50 per cent solution of 0·0363 per cent sodium citrate in distilled water The viscosity of this mixture is not given but the use of a Hopler viscometer is recommended for checking viscosities

The author seems chiefly concerned with mixtures of rock and coal material and the equivalent diameters found with such mixtures will not correctly describe the true size distributions These are calculated for a number of mixtures of coal and quartz, first of equal size and later if the materials occur in classes of different size The results are shown on cumulative size distribution curves and compared with what would be the observed curves for the mixtures

The errors in the last case are considerable but the author rightly says that in practice errors due to different densities are not likely to be very large, mainly on account of intergrowth of rock and coal particles *G Nagelschmidt*

OLDHAM, P. D & ROACH, S. A. **A Sampling Procedure for measuring Industrial Dust Exposure.** *Brit. J Indust. Med* 1952, Apr., v. 9, No. 2, 112–19 [11 refs]

The sampling procedure described is designed to estimate the total dust exposure of an average mineworker underground, allowing for the normal changes of work and of conditions of work during his working life. Only data of this kind can provide a basis for the study of pneumoconiosis. The authors

colliers ") from the group to be studied, be used to determine place and duration of sampling. For convenience each collier may be followed for one shift, and samples may be taken either continuously or intermittently. This "random collier" technique eliminates the above difficulties and also the effect of absenteeism A practical example, with thermal precipitator sampling at random times during shifts, is described, and results are presented Analysis of variance showed significant variation of dust concentration between men and for any man from day to day Automatic continuous sampling would simplify the procedure A technique of long-term survey, which allows for changing mine population, is outlined *J McK Ellison*

MILLER, L. Bestimmung der Oberflache von Quarzstaub **[Determination of the Surface of Quartz Dust]** *Beiträge z Silikose-Forschung.* 1952, No. 16, 17–30, 4 figs [Refs. in footnotes]

The paper reviews methods of determining the surface areas of mineral powders, especially of quartz and silicates, and gives a few results obtained by low-temperature gas adsorption

Microscopic measurements are considered to be slow and, unless grain shape is accurately known, unreliable. *Heat of wetting is not sufficiently sensitive* for quartz powders Determination of solubility rate in hydrofluoric acid by conductivity measurements appears possible [The author does not mention that in contrast to all other methods this is a "destructive" method.]

Air or liquid permeability is a very good method

different liquids for a powder of be very accurate d this technique for a quartz powder of the order of 1 micron and got a result 20 per cent lower than that obtained by low temperature gas adsorption. This last method is described in more detail and the author's apparatus, in which argon is used at the temperature of liquid oxygen, is sketched Preliminary data are given for adsorption of ammonia and methylene blue on powders of quartz and of a few silicates of known surface areas *G. Nagelschmidt*

HATTERSLEY, R, MAGUIRE, B A. & TYE, D L **A Laboratory Dust-Cloud Producer.** *Safety in Mines Research Establishment.* [Portobello St, Sheffield] *Research Rept* No 103 1954, Sept, 15 mimeographed pp, 2 pls. & 3 figs. [1s 6d]

The apparatus injects a metered flow of dust mixed with air into the air-stream of a wind tunnel It consists in essence of a slowly rotating horizontal disk,

The metered contents of the groove are then extracted

the results, are reported *R. L Gordon*

DAWES, J. G. **Derivation of Particle Size Distribution from Settling Curve.** *Ministry of Fuel and Power Safety in Mines Research & Testing Branch Res. Rep. No. 5.* 1950, Apr., 20 pp, 12 figs.

derived.

The author gives the results of a mathematical investigation of two methods of arriving at the particle-size distribution. The second method is less exact than the first, but with it the necessary work can be done in about one hour instead of four hours, and the agreement between the results yielded by the two methods is " reasonable ". *Thomas Bedford*

FRICKE, H. Über den Körnungsaufbau von Mahlgütern. **[On the Particle Size Distribution of Ground Materials]** *Staub.* Düsseldorf 1951, Mar 15, No 24, 30–37, 3 charts [10 refs]

This mathematical paper discusses the exponential law of Rosin-Rammler on the particle size distribution of material produced by grinding. Various erroneous deductions drawn in the literature are discussed critically and nomograms are given to facilitate the interpretation of sieve analyses, and to assess the limits of applicability of the law. *G Nagelschmidt*

OCCELLA, E Esami psammografici di alcuni materiali argillosi **[Particle Size and Petrographic Analysis of some Argillaceous Materials]** *Med d. Lavoro* 1954, Dec, v 45, No 12, 721-9, 8 figs [13 refs] English summary

[illegible]

Durkan's technique was then used to estimate the free silica content of each sample and of each of its granulometric groups The results are tabulated and also shown in graphic curves

Generally, Occella has found that samples with a lower total [illegible]

[illegible]

STETTER. Über integrale optische Staubmessung **[On Integral Optical Dust Measurements]** *Staub* Dusseldorf. 1952, Dec. 15, No 30, 225-34, 1 fig.

A theoretical paper which discusses the possibility of optical dust measurements giving a result for weight of dust per volume of air if there is a range of particle sizes It is found that for particles of the order of 1 to a few microns this is possible if the scattered light is measured over a considerable angular range near to the forward direction, and if the dust cloud is so diluted that extinction can be neglected or allowed for *G Nagelschmidt*

HELMI [illegible]

[illegible]

Microscope measurements are subject to random and systematic errors. The latter were first discussed by EHRENHAFT. They occur in the range below a few microns and are thus liable to occur with dust measurements. Under the microscope small particles appear too large This can be demonstrated with spherical particles, for instance with selenium If two such spheres are made to touch by moving them with a micromanipulator the microscope image shows a distinct overlap, ranging from 5 per cent. for spheres with a radius of 5 microns to 15 per cent for a radius of 0 5 micron A series of particles were examined by measuring their size from the settling velocity according to the Stokes-Cunningham law, and by measuring their size under the microscope. The results are shown in a curve. The microscope measurements were too large, but by using the appropriate correction factor good agreement was obtained It appears desirable to extend such work to non-spherical particles *G Nagelschmidt*

FIRST, M W **Notes on Preparation of Dust Samples for Microscopic Sizing.** *Arch. Indust Hyg. & Occupational Med* Chicago 1953, Jan, v. 7, No 1, 58-60

When large particles are present in a dust sample, those greater than about 37 microns are removed by sieving through a 400-mesh screen The material which passes the screen is then examined microscopically The weight retained by the sieve is regarded as part of the size analysis, and if a major portion is retained by a 400 mesh screen that portion [illegible]

[illegible] field depth

To produce an even dispersion of dust free from agglomerates, some rubbing-out process must be applied and this can be done with little shattering of particles by means of a wooden tooth pick. In mounting samples the use of a viscous medium is desirable to stop or retard Brownian motion and to prevent the rapid reagglomeration of the dispersed dust It is impractical to use a mounting medium of an index of refraction close to that of the particles under investigation, hence, Canada balsam should not [illegible]

[illegible] dust, if sampling is done with the membrane filter, the samples can be examined directly under an oil immersion objective *Thomas Bedford*

YAFFE, C [illegible] pari[illegible] tion-[illegible] *Hyg* [illegible] 206-10, 5 figs

If the dust sample collected on a molecular filter is too great for direct counting, the filter may be dissolved in acetone, and part of the suspension used for counting Direct microscopic examination of the samples is, however, more simple and satisfactory than examination of the dissolved material.

The authors report that when a drop of dissolved filter is brought into contact with a piece of clean molecular filter, the filter absorbs the liquid with extreme rapidity and the dust forms an apparently random disperse pattern on the filter. At the point

of reaction, the character of the filter changes from white, opaque and brittle to colourless, transparent and tough and the spot may thus be examined microscopically without the use of immersion oil. If the reaction is performed on a slide, the transparent film formed adheres firmly to the slide, thus providing a dry permanent record

Techniques are described for obtaining a specimen ¼" in diameter, with a 0 01 ml. automatic syringe of the type used in the U.S.A for testing milk and cream.

Results obtained from counts on 5 random fields in 5 aliquots of each of 2 samples indicated that the range of the counts was comparable with that usually encountered with other comparable methods

D. E. Hickish

EINBRODT, H. J. Korngrossenbestimmung in Durchlichtmikroskopie. **[Determination of Size Distributions of Dust with the Light Microscope]** *Beiträge z Silikose-Forschung.* 1953, No. 20, 37–50, 4 figs & 1 chart.

A new technique of preparing powders—especially of the dusts isolated from lung tissues—for microscopic size determination is described It uses techniques developed in electron microscopy A celluloid film about 0·2 micron in thickness cast on water is picked up with an aluminium foil which has a central hole of 0·8 cm diameter After drying, a thin layer of copper (15 μgm /cm²) is deposited on the film The dust to be measured is suspended in water at 0·1 per cent. concentration and a drop of about 5 mgm weight of the suspension is put centrally on the film After drying, the well-dispersed specimen is inverted and put on the microscope with a brass support, so that even when oil immersion is used the material is kept dry

The paper is illustrated by microphotographs in plain and polarized light and results for 5 different fractions obtained from one silicotic lung are given

G. Nagelschmidt

CROSSMON, G **Counting of Dust Particles by Phase Microscopy.** *Arch Indust Hyg & Occupational Med* Chicago 1952, Nov , v 6, No 5 416–20, 1 *fig*

"A method of counting dust particles has been [illegible] particles can be more distinctly seen and accurately counted with less fatigue than by the usual light-field method Dust particles appear in shades of gray or white, dependent on their *optical path* (refractive index X thickness), on a green background The usual counting chambers, such as the Sedgwick-Rafter cell, Dunn cell, and blood-counting chambers, can be employed. If an all-glass blood-counting chamber is used, the etched rulings appear as bright lines on a green background "

WALKENHORST, W. Elektronenmikroskopische Untersuchung von Stauben, Methoden und Ergebnisse. **[Methods and Results of an Examination of Dusts with the Electron Microscope]** *Beitrage z Silikose-Forschung.* 1952, No. 18, 27-62, 23 figs [24 refs]

After reviewing the literature on the size of dust in lungs and concluding that the use of the electron microscope is desirable in silicosis studies, the author discusses first the technique of sampling. Thermal precipitation is considered to be the best method because [illegible] distribut [illegible] is only [illegible] micron, [illegible] tional to their size The author uses a thermal precipitator with a hot tape instead of a wire. This is equivalent to oscillating the specimen holder or wire. Other necessary modifications are also described

In principle it is desirable to measure size distributions and concentrations, but the present paper deals *only* with size distributions, which are characterized by frequency and summation curves Dry drilling in sandstone gives a highly aggregated dust with a maximum diameter frequency at about 0 2 micron and an upper limit of 3 microns diameter. In wet drilling of the same rock much less dust is produced so that electrostatic precipitation and a high air flow rate had to be used to get a sample in a reasonable time The frequency maximum was at 0 037 micron; there were hardly any particles above 0·5 micron and the dust was not aggregated A picture of dry drilling dust taken a few seconds after its production under the same experimental conditions (electrostatic precipitation) showed a maximum at 0 074 micron, and partial aggregation The smallest particles seen on rock dust *pictures were of the order of 90 Å* *Pictures of coal* dusts showed these to be less aggregated than rock dust Frequency maxima were at 0·5 to 0 7 micron and it is concluded that the light microscope is adequate for evaluating coal dusts but is quite inadequate for rock dusts The paper is illustrated by a number of excellent electron micrographs

G Nagelschmidt

CARTWRIGHT, J & SKIDMORE, J. W. **The Measurement of Size and Concentration of Airborne Dusts with the Electron Microscope.** *Safety in Mines Research Establishment* [Portobello St., Sheffield] *Research Rept* No. 79. 1953, Sept , 31 mimeographed pp., 4 pls & 3 figs [12 refs] *[2s.]*

"The techniques available for the evaluation of thermal precipitator samples by electron microscopy and their sources of error are discussed [illegible]

10 microns to 0 01 micron with an optical and an electron microscope There is good correlation between the results from both instruments in an overlap range of 0 23 to 3 6 microns

"Such discrepancies as are found using the modified technique are mainly due to the greater resolving power of the electron microscope

"The electron microscope assessments are considered to be sufficiently accurate for use as a standard against which optical errors of sizing can be judged"

WILCOX, J D & VAN ANTWERP, W R **A Sampling Technique for Small Air-Borne Particulates. Particle-Size Distribution by Combined Use of Light and Electron Microscopes.** *Arch Indust Health* Chicago 1955, May, v 11, No 5, 422-4, 1 fig

The limit of resolution of small particles under the optical microscope lies between 0 2 and 0 8 micron according to the nature of the particle and the optical equipment used With the electron microscope the limit of resolution is about 0 01 micron, but with this instrument the maximum useful width of field is about 20 microns, and the number of particles per unit area probably cannot be determined correctly for particles larger than 10 microns Hence for a particle size analysis of a very heterogeneous dust (say, [illegible]) both forms [illegible] describe a [illegible] particularly [illegible] ectly on to an electron-microscope specimen film, supported on a 200- or 400-mesh screen which is mounted in the supporting cap used in the electron microscope The sampling instrument, a 5-stage cascade impactor, gives a partially graded sample, the fractions of which fall readily within the range of 1 to 100 microns for optical-microscope analysis, or of 0 01 to 10 microns for use with the electron microscope Special slides and screws, which are illustrated, are used in the cascade impactor

Initially, all fractions of the sample are examined in the electron microscope, and those which contain no particles smaller than 1 micron are then analysed under the optical microscope For those containing sub-micron particles the electron microscope is used The various steps in the examination are set out in the paper

The cascade impactor is not regarded as efficient for sampling particles smaller than 0 2 micron or larger than 100 microns, but particles from 0 02 to 200 microns have been measured in various samples An effluent filter is used to collect particles not deposited in the impactor and the use of a plastic filter, from which the particles can be recovered and embedded in a specimen film, may provide a means of counting these "slipped" particles

It is remarked that the general technique here described has been used successfully also with centrifugal, thermal and gravity methods of particle deposition, but for heterogeneous samples the cascade impactor appears more suitable than instruments based on these other principles *Thomas Bedford*

CARTWRIGHT, J **The Electron Microscopy of Air-borne Dusts.** Reprinted from *Brit. J. Applied Physics* 1954, Suppl 3, S 109-S 117, 5 figs. Discussion S 117-S 120, 4 figs

There is difficulty in reconciling optical and electron microscope assessments of airborne dusts The work described in the present paper was carried out to examine the relation between the two types of assessment of dusts within the size-range of 0 3 to 3 microns The thermal precipitator was used as the sampling instrument

Previous workers have obtained samples for electron microscopy by using in the thermal precipitator membrane-coated specimen grids in place of cover glasses, but the sample is then not collected under precisely the same conditions as a sample taken on a cover glass for optical counting After samples are taken errors of evaluation may arise through various causes

The author describes how these difficulties have been avoided by care of manipulative techniques and by taking samples on membrane coated cover glasses The preparation of these cover glasses is described

Samples are collected over a rather longer time than usual so as to obtain denser deposits For optical counting the cover glasses are shadowed with an alloy of 60 per cent gold and 40 per cent palladium The methods of preparing and manipulating the electron microscope are described in detail

It seemed that with the successful use of these [illegible] electron microscope was reduced to equal that of the optical microscope, counts made by the two methods showed no serious discrepancy

The author concludes that in evaluating dust samples it is normally desirable to use a combination [illegible] considerable technical significance were raised

Thomas Bedford

PFEFFERKORN, G Die Bestimmung staubförmiger Mineralien durch Anfärbung **[The Identification of Mineral Dusts by Staining]** Reprinted from *Forsch u Fortschr.* 1949, Apr, v. 25, Nos. 7/8, 94-6 [14 refs]

nature is plain, even when they are as small as 0·7μ. In certain cases, by using ultra-violet illumination and looking for fluorescence, stained particles can be recognized which are smaller than the limit of optical resolution.

This paper gives a general account of staining methods, without actually detailing a scheme of analysis, and includes some useful references The principles underlying staining with dyes and chemicals are reviewed and attention is drawn to various sources of error. *C. N. Davies*

BUTLER, A & GODBERT, A L. **The Colour Measurement of Mine Dusts as a Method of estimating their Contents of Inert Material.** *Safety in Mines Research Establishment* [Portobello St, Sheffield] *Research Rept* No 57. 1952, Dec, 21 mimeographed pp, 5 figs [1s 6d]

Regulations made under the Coal Mines Acts require that the roads of a coal-mine shall be strewn with stone dust in order to prevent the propagation of a coal-dust explosion along them The proportion of inert dust required in the road dust varies with the proportion of volatile matter in the coal seam which the road serves The proportions of stone dust vary from 50 to 75 per cent Methods of chemical analysis for determining the inert content of a road dust are prescribed The analysis is a lengthy procedure and a crude estimate of the inert content of a dust may be obtained more quickly from its colour. The colour method can lighten the work involved in chemical analysis by enabling one to decide that certain samples contain such a preponderance of inert material that no chemical analysis is necessary

This paper describes a simple photo-electric instrument for measuring the light reflected from dusts and so estimating their inert dust content The standard dust used in the apparatus has an inert content of 80 per cent The method has been applied to mine dusts from a number of collieries in order to determine its accuracy with the proportion of inert dust ranging from 50 per cent upwards. Over this range, the instrument has a satisfactory precision

Moisture content and fineness of the dust affect the reflectivity and these effects have been investigated Moisture darkens the dust and thus causes the inert content to be underestimated Its presence therefore gives a margin of safety. Increase in fineness of the coal dust darkens the dust and appears to make it more dangerous—as indeed it is Increase in the fineness of the inert dust lightens the dust and makes it appear less dangerous—as it is *Thomas Bedford*

BLANZAT, A & BARBE, M. Méthode microchimique de détermination de la silice libre dans les poussières de mines **[A Micro-Chemical Method of determining Free Silica in Mine Dusts]** *Arch Malad Professionnelles* Paris. 1953, v 14, No 4, 349-53, 2 figs [11 refs]

In the method described the silicates present are [illegible]

[illegible] calibration is based on particles below 5 microns, selected by sedimentation, and is very inaccurate for particles below 1 micron. Since the estimation of quartz is gravimetric it is claimed that with the dusts examined so far the error so introduced is small. Only 10 mgm of dust are required

It is stated that the silicates not readily dissolved in H_3PO_4 [illegible]

J. McK. Ellison

STEGEMANN, H. & FITZEK, J. Analyse von Lungenstauben. I. Die mikroanalytische Bestimmung von Silicium in quarz- und silikathaltigen Staubproben **[Analysis of Lung Dusts. I. The Micro-Analysis of Silica in Dust Samples containing Quartz and Silicates]** *Beiträge z Silikose-Forschung.* 1954, No. 31, 29-40. [11 refs]

The paper deals entirely with analytical chemistry. It is demonstrated that colorimetric silica determinations in the range of 40-180 μgm. SiO_2 in 100 ml solutions can be carried out with an error of $\pm$0·4 per cent and with a slightly greater error for lower silica concentrations Thus the method is comparable in accuracy to gravimetric techniques for similar amounts.

[illegible] naphthal sulphonic acid as reducing agent is used and, in routine operation, fluoric and boric acids are added to keep all silica in a reactive form.

The removal of iron and phosphate by ion exchange is of particular interest. *G. Nagelschmidt*

ZURLO, Nicola & GRIFFINI, Angela M. Determinazione chimica del quarzo nei minerali e nelle polveri. **[Determination of Quartz in Minerals and Dusts]** *Med. d Lavoro.* 1954, Dec, v. 45, No. 12, 675-91, 2 graphs

The English summary appended to the paper is as follows —

"The difficulties encountered in the chemical determination of free silicotigenous silica are due above all to poorly soluble silicates and minerals which, for their elimination, require acids not altogether inert to quartz The problem was virtually overcome in

* v. II, 369

1946 by Durkan who, suggesting the coupling of H_3PO_4 and bisulphate, set up an accurate and reliable method both for minerals and very fine dusts and, after a long and accurate study, measured the optimum breakdown energy

"Proceeding on Durkan's lines, we have measured, by means of a theoretical experimental study, the [illegible]

[illegible]

energy so as to solubilize only a minimum fraction [illegible]

[illegible]

experimentally confirmed Residues of considerable purity are usually obtained where determinations are carried out on samples reduced to mean particle sizes of about 5–10 microns

"The silicic acid, produced by breakdown, is brought to solution by the direct action of diluted HF (1·6) on the phosphorus residue diluted with water The time required to eliminate the silicic acid is reduced to a few minutes; the loss of quartz is maintained low by the high dilution of the HF

"*Procedure*. The sample, reduced to 5–10 micron dust, after preliminary attack with HCl, is broken down with H_3PO_4 and diluted with water The silicic acid is dissolved by direct addition of diluted HF; the action of HF is arrested with H_3BO_3 It is filtered and calcined at 850°C The residue is checked for purity by volatilization with HF-H_2SO_4 or by petrographic or debyegraphic analysis

"Where silicates or minerals resistant to H_3PO_4 are present, breakdown is completed by fusing with $KHSO_4$

"To obtain complete breakdown where minerals little soluble in H_3PO_4 are present, the sample must be reduced to < 5 micron dust The HCl of the preliminary attack is substituted with HNO_3 where sulphides are present"

LÖBNER, A. Leitstaube als Hilfsmittel bei der optischen Analyse von Staubpräparaten. Mitteilungen aus der Praxis [**Guide Dusts as Aids in the Optical Analysis of Air-Borne Dusts**] *Staub* Düsseldorf. 1950, Oct. 15, 281–8, 6 figs.

In order to trace specific sources of air pollution, it is helpful [illegible]

[illegible]

microscopy, and chemical analyses, of samples collected at various distances from the source of the dust, for zinc oxide from a zinc smelting factory.

The potential danger of open refuse heaps in Berlin shortly after the end of the war was assessed from observations of the characteristic reddish-brown lignite ash which decreased rapidly as a dust component over a distance of twenty yards Air pollution from a cement factory [illegible]

[illegible]

CROSSMON, Germain. **Determination of Free Silica by Dispersion Staining Microscopical Methods.** *Amer. Indust Hyg. Ass. Quarterly.* 1951, Sept., v. 12, No. 3, 117–20. [11 refs.]

Two procedures—a dark-field and a phase-microscope method—are described. In the dark-field method, if the difference between the refractive indices of the free silica particles and of the liquid in [illegible]

[illegible]

differ in refractive index is deviated by the free silica [illegible]

[illegible]

With the dark-field method, free silica particles [illegible]

[illegible] 1·25 N A, transmission 3·5 per cent) free silica particles as small as 2 microns have been identified. Further investigation is needed of the accuracy of the two methods for distinguishing between free silica and minerals of very similar index of birefringence.

Thomas Bedford

LÉPINE, P & CROISSANT, O. Étude morphologique [illegible]

[illegible]

The study here reported was made on 6 samples of dust obtained from workplaces in the Province of Quebec, Canada, and sent to the Pasteur Institute, Paris The samples were carefully treated to remove all but the most minute particles. They were then examined by the electron microscope The dust was found to contain crystalline needles, smaller in size, but otherwise similar to those seen by an [illegible] ...rsed from [illegible] were also [illegible] morphous [illegible] contour

they were particles of serpentine Such particles could readily gain access to the alveoli of the lungs. The needles had a diameter of 28 mμ ; they occurred in bundles about 0 85 μ or more in diameter. Isolated needles, apart from the bundles, varied in length from 0·05 to 2 5 μ. As the samples were not col- [illegible]

particles should easily undergo phagocytosis, with the formation of the tissue lesions characteristic of asbestosis. The appearance of the particles as seen under the electron microscope is shown in illustrations.

E. L. Collis

CLELLAND, D W, CUMMING, W. M. & RITCHIE, P. D. **Physico-Chemical Studies on Dusts. I. A High-Solubility Layer on Silicious Dust Surfaces.** *J. Applied Chem.* 1952, Jan, v. 2, Pt. 1, 31–41, 9 figs [12 refs]

Studies of the silica solubility of two sources of pure quartz (rock crystal and Lochaline sand), of vitreous silica and of felspar and olivine are described Most of the work was done with a borate buffer at pH 7 4 and several pre-treatments were given to the samples The work led to the main conclusion that a high-solubility layer exists on the surfaces of all these materials It can be stripped by repeated buffer extraction and the slow decrease in rate of solubility suggests a gradual change from surface layer to core After stripping, the high-solubility layer can be re- [illegible]

be filtered by collodion filters and consists of hydrated colloidal silica In the presence of aluminium less total and molybdate-reactive silica are liberated, but the relative proportion of the colloidal silica is increased, probably because the aluminium prevents its dissociation.

G Nagelschmidt

CLELLAND, D. W. & RITCHIE, P. D **Physico-Chemical Studies on Dusts. II. Nature and Regeneration of the High-Solubility Layer on Silicious Dusts.** *J. Applied Chem* 1952, Jan, v 2, Pt 1, 42–8, 4 figs [13 refs]

The nature of the high solubility layer on silica is discussed Reasons are given why it is not hydrated silica but an amorphous layer of the type described by BEILBY This is supported by density measurements which show a reduction of density of rock crystal, due to production of vitreous silica of lower density than quartz. The density of vitreous silica, on the other hand, increases on grinding, probably because sealed pores in it are opened.

Experiments are described which show that the high-solubility layer, after removal by stripping with borate buffer, can be regenerated by polishing with quartz or silicon carbide. Most of the silica from the regenerated high solubility layer consists of colloidal silica which does not react with molybdate

G Nagelschmidt

CUM[illegible] W. M. [illegible]

[illegible] 1952, July, v. 2, 415–22, 6 figs [22 refs]

The first part of this paper describes a method of characterizing air-borne dust clouds by an empirical "settling factor". This factor is obtained from a number of measurements of the obscuration of light at set intervals up to 600 seconds after putting up the cloud With 4 coarsely graded and 1 ungraded dust, neither concentration nor relative humidity (0 per cent and 100 per cent, temperature not stated) affected the settling factor Intermittent spraying had no appreciable affect, but continuous spraying appreciably accelerated the disappearance of the finer aerosols (mean diameter 1 micron or less) This was more marked with finer sprays, and with the finest spray used (mean droplet size 30 microns) the larger particles (up to 5 microns) were also carried down. The addition of wetting agents to the spray greatly increased its effectiveness, particularly in dealing with the larger particles against which sprays of pure water were ineffective

[There are a number of suggestive points in this paper, and these deserve further study. Neither the experiments nor the settling factor in which their results are expressed are sufficiently precise in conception to permit any very reliable conclusions to be drawn]

John McK Ellison

CUMMING, W. M, DEMPSTER, P. B & RITCHIE, P D. **Physico-Chemical Studies on Dusts. IV. Accuracy of Chemical Estimation of Free Silica in Rocks and Mineral Dusts.** Reprinted from *J. Applied Chem.* 1952, Nov., v. 2, 658–63, 2 figs [11 refs]

The paper gives a critical examination of the Trostel-Wynne method for determining quartz in mixtures with silicates, which is based on an attack of the material by sodium bisulphate. It was found that two fusions are necessary and several corrections must be applied for undecomposed minerals and for loss of quartz as a function of size. This was studied [illegible] size classes of quartz [illegible] er losses [illegible] which a [illegible] sulphuric

[illegible]chmidt

DEMPSTER, P. B. & RITCHIE, P D. **Physicochemical Studies on Dusts. V. Examination of Finely Ground Quartz by Differential Thermal Analysis and other Physical Methods.** Reprinted from *J Applied Chem* 1953, Apr, v. 3, 182–92, 4 figs [29 refs]

The paper gives details of the DTA [differential thermal analysis] technique used by the authors, with a sample block of sintered alumina, 0 5 gm samples and mainly following the techniques developed by ROBERTS and GRIMSHAW. Comparison with the Trostel and Wynne chemical method showed DTA results to be lower. The DTA quartz results for finely ground quartz are very low, but after etching with hydrofluoric acid (HF) the residues showed high quartz contents For instance, a sample below 1 micron showed a quartz content of 36 per cent After etching with HF the residue gave 99 per cent quartz

This is explained by assuming that grinding produces a disturbed layer on the outside of the quartz grains

From combined density and DTA measurements it is possible to determine thickness and density of this disturbed layer

The thickness is of the order 0 14 micron and the density 2 55 to 2 59 This is much denser than vitreous silica (2 22) Calculations are based on the published apparent quartz losses by a chemical (Durkan) method This suggests that the losses correspond to a thickness of about 0 06 micron

Finally reference is made to similar results obtained by DTA and X-ray diffraction methods in other laboratories. *G Nagelschmidt*

GIBB, J G, RITCHIE, P D & SHARPE, J W **Physicochemical Studies on Dusts. VI. Electron-Optical Examination of Finely Ground Silica.** Reprinted from *J. Applied Chem* 1953, May, v 3, 213-17, 13 figs on 2 pls [17 refs]

Previous work [DEMPSTER & RITCHIE, NAGELSCHMIDT, YORDEN & GRIFFIN, this *Bulletin*, 1953, v 28, 121]* had established the probable existence of an amorphous layer on the surface of finely ground quartz powder. The present paper describes attempts to verify the existence of this layer by electron diffraction at various accelerating voltages by transmission and reflection techniques Samples of fine quartz from two sources and of vitreous silica were used, both before and after etching with concentrated hydrofluoric acid or after leaching with a borate buffer The silica solubilities were reduced to values varying from one half to one fifteenth of the original solubilities.

Positive effects were observed in all cases with the quartz samples At low kilovoltage an etched sample

...ities had become less frequent or had disappeared Physical considerations under simplifying assumptions suggest that the truly amorphous layer varies between 0 03 and 0 05 micron in thickness, but the total disturbed layer may be much thicker

G Nagelschmidt

* p 83.

GIBB, J. G & RITCHIE, P. D. **Physicochemical Studies on Dusts. VII. The Effect of Acids on the Solution Properties of Silicious Dusts.** Reprinted from *J Applied Chem* 1954, Sept, v 4, 473-83, 6 figs [16 refs] **VIII. Some Sorption Properties of Silicious Dusts.** *Ibid.*, 483-7, 4 figs

BODDY, R G H. B **Microscopical Identification of the Constituents of Coal Dust.** [Correspondence] *Nature.* 1953, May 23, v. 171, 928-9, 2 figs.

THAER, A Ein Beitrag zur lichtmikroskopischen Mineralbestimmung in Feinstauben insbesondere des Kohlenbergbaues **[A Contribution to Mineral Identification, by Light Microscopy, in Airborne Dusts, especially from Coal Mining]** *Staub* Düsseldorf 1954, Dec. 15, No 38, 555-70, 10 figs (6 coloured on pl) [21 refs.]

The article discusses the various techniques of

diameter of 2 microns

Phase-contrast technique is still more sensitive, and

1 micron

Examples are given of quantitative analysis of ashes of coal mine dusts obtained by ashing at 450°C. The paper is illustrated by 6 colour photographs

G Nagelschmidt

SCHEDLING, J A Die differential-thermische Analyse und ihre Anwendung zur Bestimmung des ... **Differential** ... **asuring the** ... Düsseldorf.

The principle of DTA is briefly described and its use for quartz determinations pointed out The author uses a metal block as sample holder, samples of about 1 gm, and aluminium oxide as inert material. A calibration curve for quartz-aluminium oxide

mixtures is reproduced which shows a fairly good linear relation between peak heights on the cooling curve and quartz percentage. This is obviously a preliminary account and contains nothing new.

G. Nagelschmidt

SCHEDLING, J. A. Über die Differentialthermoanalyse quarzhaltiger Staube. **[Differential Thermal Analysis for Determination of Quartz in Dusts]** *Staub*. Düsseldorf. 1952, Dec. 15, No. 30, 243–4.

This is a brief note on differential thermal analysis for quantitative quartz determination The author uses a steel sample block and a vertical muffle which can be lowered over the block. Calibrations were made with calcined alumina A number of talc samples had to be measured which seemed to contain only about 1 or 2 per cent of quartz. These were measured against quartz-free talc and similar amounts of quartz were then added to the sample to be measured In this way it was confirmed that reasonable results had been obtained previously and quantitative determinations down to 0·5 per cent. of quartz are said to be possible.

G. Nagelschmidt

SCHEDLING, J. A. & WEIN, Johanna B. Quarzgehaltsbestimmung an Schleifscheibenstäuben mittels der Differentialthermoanalyse **[Determination of Quartz in Dusts from Grinding Dusts by Differential Thermal Analysis]** *Staub.* Dusseldorf. 1953, Mar. 15, No. 31, 13–18, 7 figs

The paper gives results of quartz determinations by differential thermal analysis for the dust from synthetic grinding plates made of ceramically bound corundum It was found that the raw materials, corundum, silicon carbide and titania, did not show any thermal effects in the region of 575°C. but that the felspar, clay, kaolinite and iron oxide used in manufacture contained between 4 and 38 per cent. of quartz. Results for a number of disks and bonding mixtures are given Quartz percentages above 5 per cent. are assessed directly, for smaller percentages an extrapolation technique is used First the material is tested alone and afterwards known small increments of quartz are added to the sample, giving a series of larger and larger thermal effects. The smallest amount of quartz thus measured was 0 3 per cent

G. Nagelschmidt

KAY, K. **Rapid Quartz Analysis by X-Ray Spectrometry.** *Amer. Indust. Hyg. Ass. Quarterly.* 1950, Dec., v. 11, No. 4, 185–94, 6 figs.

This paper discusses quantitative determination of quartz by X-ray diffraction with the Norelco Geiger Counter equipment. The internal standard technique with calcium fluoride is used and all data reported refer to standard mixtures of quartz, calcium fluoride and calcium carbonate. Measurements are based on the relative intensities of the quartz line at 3 34 Å and the calcium fluorite line at 3·16 Å. KLUG *et al.* [this *Bulletin*, 1948, v. 23, 860] had previously * found that a higher accuracy is obtained by counting than by recording with the Norelco apparatus, but counting requires far more time. The present paper outlines a technique by which three records are taken from each specimen and two or three specimens are made for each sample to be analysed, in an attempt to overcome the inaccuracy of single records by replication.

The author describes a standard technique of grinding the samples and of making specimens with collodion as a binder into thin powder layers on microscope slides. By this technique, quartz percentages between 1 and 100 per cent. can be determined with an accuracy of ±1·5 per cent. at 12 per cent. level, and ±3 per cent. at 100 per cent. level, with a minimum sample weight of 300 mgm.

G. Nagelschmidt

PARMEGGIANI, L. Il metodo di Debye-Scherrer nell'analisi delle polveri industriali silicotigene. **[The Debye-Scherrer Method of Analysis of Silicosis-Producing Dusts]** *Med. d Lavoro* 1951, Jan, v. 42, No 1, 10–25, 10 figs. [24 refs] English summary.

For over a year, in the Clinica del Lavoro of the University of Milan, chemical, mineralogical and X-ray spectrographic methods have been used for the examination of industrial dusts with possibly silicosis-producing properties; the Debye-Scherrer method of X-ray spectrography was the method used, and in this article the author gives a description of this method and an account of the development of X-ray spectrographic technique and its various applications as described in the literature.

The Micro-Metalix apparatus used in the researches at the Clinica del Lavoro is described as well as the method of use Special attention is given to the examination of samples of industrial dust containing silica, the three allotropic forms: quartz, tridymite and cristobalite can be distinguished by the method, and the changes of phase which occur under the influence of high temperatures are described Reference is made to the investigation carried out by VIGLIANI and MOTTURA on the changes occurring in diatomite during the calcining process in the manufacture of porous filter candles [see this *Bulletin*, 1948, v 23, 861] It is pointed out that the fact † that cristobalite, which is optically symmetrical, produces silicosis disposes of the hypothesis that the pathogenic action of quartz depends on a piezoelectric property.

E L. Middleton

SCHMELZER, L L **A Rapid X-Ray Diffraction Method for the Determination of Quartz in Industrial Dusts.** *Arch. Indust Hyg & Occupational Med* Chicago 1951, Feb, v. 3, No 2, 121–8, 2 charts. [14 refs.]

The paper describes a method of determining

* v. II, 371. † v. II, 148

free from superimposed lines due to other constituents of the dust, and three to five measurements are made alternately on the standard quartz and the sample to be examined The mean ratio of peak heights gives the percentage of quartz in the unknown sample Results are reproducible within a few per cent, and by using known mixtures of quartz and various carbonates made up in the laboratory the author found that errors exceeding 10 per cent (of the quartz present) occurred only with samples containing less than 20 per cent of quartz The errors may reach 50 per cent of the true value if the sample has less than 10 per cent of quartz

Comparative quartz determinations for a series of samples are given, obtained from three laboratories, by three chemical and two X-ray methods Agreement between the X-ray results was slightly better than between chemical results obtained by different methods *G Nagelschmidt*

In this method the dust under investigation is mixed with a known proportion of another dust (MgO), one of whose X-ray diffraction lines is close to two quartz lines The diffraction pattern is photographed ...

... compared with chemical "free silica" analysis With one exception, duplicate X-ray results agree within 10 per cent Comparison with chemical analysis shows marked scatter below 20 per cent quartz, and above this value X-ray results average 3–4 per cent higher than chemical, but data for quartz concentrations above 40 per cent are very scanty The "mean quartz rating" by X-ray diffraction is size-dependent, smaller particles contributing proportionately less to X-ray diffraction than to mass This is attributed to an amorphous layer on the surface of the particles, and the properties of this layer are investigated

This paper should be of great interest to laboratory workers concerned with quartz determination

J. McK. Ellison

LENNOX, D & LEROUX, J. **Applications of X-Ray Diffraction Analysis in the Environmental Field.** *Arch Indust Hyg & Occupational Med* Chicago 1953, Oct, v 8, No 4, 359–70, 11 figs

The authors give a good account of the methods they have developed for the identification of substances which are frequently harmful in industrial processes The technique involves X-ray analysis of the diffraction patterns obtainable only when the substances are in crystalline form

There are two main methods of registering the diffraction pattern, one is by means of a special camera, the other by a Geiger counter spectrometer. The latter gives greater resolution than the camera and takes less time, for preparation and interpreta- ...

... be of an exacting character *S Russ*

QUINOT, E Utilité de la diffractographie dans l'analyse qualitative et quantitative de la silice. **[Use of X-ray Diffraction in the Qualitative and Quantitative Analysis of Silica]** *Arch Malad Professionnelles* Paris 1953, v 14, No 1, 19–24, 8 figs [Similar paper appears also in *Rev Méd Minière.* Douai. 1952, v. 5, Nos 19/20, 45–53, 8 figs (26 refs)]

In these two papers the author gives a short description of powder analysis by X-ray diffraction, for the benefit of those unfamiliar with this technique

John McK Ellison

SECTION XII

DUST CONTROL

eriodical Reports Relating to Dust Control—General—Mechanical Picks and Drills—Infusion of Water the Face—Sprinkling and Spraying—Wetting Agents , salt—General Collection and Filtration of Dust—Stone Dusting—Mine Ventilation—Protective Equipment

MINISTRY OF FUEL AND POWER **Report of H.M. Chief Inspector of Mines under the Coal Mines Act, 1911 for the Year 1949** [BRYAN, A M.]. 54 pp, 2 charts & 3 figs 1950. London: H M Stationery Office. [1s 6d.]

* * *

In the effort to reduce the incidence of pneumoconiosis attention is being given to dust reduction At the coal-face water is used for infusion into the seam, for application to coal cutters, for spraying heaps of coal and stone, with pneumatic picks, and with drilling machines Sprays are being used at conveyor transfer points and loading points, and on trams after loading. The possibility of extracting dust dry is considered, and the importance of ventilation in reducing dust concentrations is mentioned.

Pneumoconiosis is still the largest and most complex medical problem in the coal-mining industry. Beat knee occurs more frequently than it should.

Thomas Bedford

MINISTRY OF FUEL AND POWER **Report of H.M. Chief Inspector of Mines under the Coal Mines Act, 1911 for the Year 1950** [BRYAN, A M] 63 pp, 2 graphs, 2 figs & 1 map 1952 London H M Stationery Office [1s 9d]

* * *

The subject of dust prevention receives a considerable amount of attention in the Report Some progress was made in the application of measures for preventing and suppressing dust, but it has not been fast enough, there was an increase of about 60,000 yards of coal face treated, but only 188,450 yards of face were being treated at the end of 1950 out of a total of 330,169 yards requiring treatment Commendable advance was made in the North-Western and North-Eastern Divisions Details of the length of coal face being treated by wet cutting, water infusion and hand spraying in the various Divisions are given in a table Details are also given of dust suppression at stone drilling operations with power-driven tools, by water- and foam-feed, and by dust traps, over 98 per cent of the percussion drills and about 78 per cent of rotary drills used in stone were fitted with means for suppressing dust Particulars of dust suppression during transport of coal are given, showing the numbers of conveyor transfer and loading points fitted with sprays or dust extractors, and means for the spraying of loaded tubs A review is given of the results of experience in the application of measures for dust suppression by water infusion, which has been applied to 44,500 yards of coal face, by wet cutting, which has been found effective when carried out with equipment adapted to the local conditions, by wet picks, in the use of which the fullest co-operation is necessary between management and workmen; and by hand spraying of coal before loading, where supervision is required to control neglect. Drilling in stone with power-driven machines should always be done wet, where a piped supply is not available portable tanks can be used with compressed air or a pump; when neither water nor foam is practicable a dry dust trap may be used At conveyor transfer and loading points dust control may require equipment and methods specially designed to meet the local conditions It has been agreed that the use of shale dust for stone dusting should be discontinued; examination of samples of shale showed as much as 35 per cent. of free silica Tests with wetting agents have been inconclusive so far, but they are to be continued, with a higher percentage than the 0 2 per cent of the agent commonly used Methods of road consolidation with various chemicals are discussed

E. L. Middleton

* * *

MINISTRY OF FUEL AND POWER **Report of H.M Chief Inspector of Mines under the Coal Mines Act, 1911 for the Year 1951** [ROBERTS, H. C W.]. 63 pp, 2 charts & 3 figs [Refs. in footnotes.] 1953. London. H M Stationery Office [2s]

* * *

Noteworthy efforts are being made to prevent or suppress airborne dust. Taking all coal mines in Great Britain, there are 714,000 yards of coalface being worked On 335,000 yards it is considered that dust suppressive measures are necessary, and such measures—water-infusion, wet-cutting, or spraying—

were being applied on over 247,000 yards in 1951, the year under review, as compared with 189,000 yards in the previous year. In the South-western Division, which includes the anthracite field, roughly 98 per cent of the faces requiring suppressive treatment were being so treated

It is generally agreed that the ordinary dry pneumatic pick can produce excessive concentrations of airborne dust, but the design of a wet pick acceptable to miners is difficult, and the position is still unsatisfactory Of over 6,000 picks in the South-western Division only 824 were fitted to use water for dust suppression, and in the North-eastern Division only 3 of the 3,000 in use were so equipped Of the power-driven drilling machines for boring in stone used in the South-western Division over 90 per

points there were sprays or dust extractors, but over the rest of the coalfields only about 40 per cent. were so provided

By the end of 1951 the National Coal Board employed 46 full-time doctors, and further appointments were being considered Advances have been made in the provision of first-aid facilities underground Selected first-aid men are authorized to administer morphia to the injured, and 869 mines come within the scheme

During the two years 1950 and 1951, 1,135 men were awarded compensation for pneumoconiosis under the Workmen's Compensation Acts, and 6,782 under the Industrial Injuries Schemes Of the latter number 45 per cent were awarded disablement assessments of 10 per cent or less, 41 per cent were assessed as 20 to 40 per cent disabled, and in the remaining 14 per cent the disability was assessed at 50 per cent or more About half the men diagnosed as pneumoconiotic continued working in the mines

Thomas Bedford

Ministry of Fuel and Power **Report of H.M. Chief Inspector of Mines under the Coal Mines Act, 1911 for the Year 1952** [Roberts, H C. W.]. 79 pp , 2 figs & 4 charts 1954 London H M Stationery Office [3s]

• • •

Except in the Scottish Division considerable progress was made during the year in the application of measures for the prevention and suppression of dust Pneumatic picks fitted with a water supply for the suppression of dust are available These are rather more awkward in use than picks not provided with water, and there is resistance to their introduction. Of the 1,240 such picks in use, 1,127 are in the South-Western Division.

The numbers of men diagnosed each year, from 1943 to 1952, as suffering from pneumoconiosis are shown graphically One curve relates to the South-Western Division, which includes the anthracite field and which has long been regarded as the black spot in this respect, and the other curve represents all other Divisions It is of interest to note that whereas the curve for the coal-fields other than the South-Western Division shows throughout a steady rise in the number of certifications, in the South-Western Division, where the number of new cases in 1952 was little more than one-quarter of the 1949 figure, the degree of disablement is also declining Of those certified in 1952 the disablement was assessed as 10 per cent or less in 74 per cent It is clear that pneumoconiosis is no longer a problem peculiar to South Wales [It seems reasonable to conclude that the decline in the number of cases from this Division is possibly an effect of the rigorous campaign against dust that has been carried out there over the past 10 years or so]

Thomas Bedford

Ministry of Fuel & Power **Twenty-Eighth Annual Report on Safety in Mines Research 1949** [Wynn, A H A , Director] 62 pp , 19 figs & 6 pls [42 refs] 1952. London · H M. Stationery Office [2s 6d]

• • •

been begun

A new "Dust Assessor" is briefly described. This instrument records the time taken to draw a small known volume of dusty air through a filter paper with a constant drop in pressure across the paper.

pump, a cap-lamp densitometer has been devised Tests in the laboratory show that readings can be repeated with an accuracy equal to that obtainable

This difference appears to be due to loss of dust in transit to the laboratory *Thomas Bedford*

Ministry of Fuel & Power **Twenty-Ninth Annual Report on Safety in Mines Research 1950** [Wynn, A H A , Director] 48 pp , 4 figs & 4 pls [43 refs] 1952 London : H.M. Stationery Office [2s]

• • •

Much attention is being given to dust control and the pneumoconiosis hazard. It is cogently remarked that only the prevention of dust will prevent pneumoconiosis and this is primarily a task for the mining and mechanical engineers It is provisionally concluded that so long as attention is confined to dust particles between 0·2 and 10 microns in diameter, the number of particles, the weight, and the specific surface all give reasonable estimates of the health hazard The size distribution of dust particles in lung residues is being studied For the rapid analysis of crystalline dusts X-ray diffraction is particularly suitable, and good results have been given by this technique The mineral constituents of lung residues have been studied.

A rough but quick estimate of dust concentrations is yielded by the S.M.R.E cap-lamp densitometer An automatic dust sampler was described in an earlier report, and an elutriator has now been designed which can be attached to it to ensure that only the smaller particles are collected.

Thomas Bedford

Ministry of Fuel & Power. **30th Annual Report on Safety in Mines Research 1951** [Wynn, A. H. A., Director]. 55 pp, 6 figs. & 4 pls. [65 refs.] 1952. London· H M. Stationery Office. [2s 6d.]

Work on dust control in relation to the pneumoco-iosis hazard has been directed to improving the iethods of assessing the quantity and mineralogical omposition of airborne dust Dust sampling needs uitable instruments and suitable operational procedures, and as a first step in the study of procedures studies have been made of the variations in dust concentrations during various shifts. Some improvements in the procedure for sampling with a hand-pump have been recommended. For routine sampling underground a new liquid-trap dust sampler has been devised, and work has been done with the tyndallometer. Dust-counting is laborious, and methods of automatic counting are being examined. Continued study is being made of the dust production by drilling machines, by pneumatic drills, and during the preparation of shot-holes. There have been tests of oil-in-water emulsions for dust suppression and on a dust extraction plant

The effects of dust concentration, rank of coal, and the presence of sandstone strata on the incidence of certified pneumoconiosis have been examined Techniques for X-ray-diffraction analysis have been developed, and the solubility of silica is being studied.

The report includes synopses of research reports and papers published during 1951.

Thomas Bedford

Ministry of Fuel and Power. Safety in Mines Research Establishment. **Thirty-First Annual Report on Safety in Mines Research, 1952** [Wynn, A. H. A., Director]. 76 pp., 9 figs and 4 pls. [Numerous refs] 1953 London: H.M. Stationery Office. [3s.]

Experiments suggest that a very heavy spray produced by the propulsion of water by explosive at the end of a round of shots may effectively suppress dust and fumes. The method is contemplated for blasting in headings where as much as 70 lb. of explosive may be fired in one round.

Many dangers are associated with coal-cutting Coal-cutters produce much of the dust responsible for pneumoconiosis or for explosions, and they cause many fires Much thought has been given to combining the techniques of water-infusion and shot-firing, for it is thought that such a combination might make the undercutting of coal unnecessary

Research is proceeding on the design of breathing apparatus It has been shown that in the present type of liquid-air apparatus the cooling capacity of the liquid air is not used as efficiently as it might be to provide a supply of dry, cool air. Much could be done to reduce the weight of the apparatus.

Progress reports are given on various studies of th fire hazard These relate to the smouldering of coa dust, the inflammability of brattice cloth, toxic fum from impregnated timber and conveyor belting, stenc agents as heat detectors, the propagation of a vapo cloud, and firebreaks underground There are al reports on a variety of engineering and metallurgi studies

In connexion with dust control and the pneu coniosis hazard, work has continued on the devel ment of instruments for the quantitative and qual... tive assessment of airborne dusts, and on sampling procedures A size-selector has been fitted to an automatic hand-pump for sampling in the presence of coarse dust. A liquid-trap dust sampler is a suitable instrument for long-term gravimetric sampling, and will give samples suitable for compositional analysis.

An investigation of the dust production of rotary drilling machines has shown that the dust produced per minute of drilling is proportional to the speed of revolution of the drill Hence to get minimum dust production sharp bits with high values of thrust should be used at low speeds of revolution.

In wet-drilling the cleanliness of the water used is of importance Dirty water may be responsible for a large part of the dust dispersed by the drill

A pneumatic drill with an axial hole in the drill steel, through which dry drillings are exhausted from the point of formation and then removed by a filter system, has been tested. So long as the filtering system did not become clogged the dust suppression was as efficient as with most wet drills—but the collected dust must be so removed from the dust trap as not to be re-dispersed in the mine

A method of testing respirators with a cloud of

analysis are noted

The Report includes synopses of 49 reports and papers published in 1952 *Thomas Bedford*

MINISTRY OF FUEL AND POWER SAFETY IN MINES RESEARCH ESTABLISHMENT **Thirty-Second Annual Report on Safety in Mines Research 1953** [WYNN, A. H. A., Director] 83 pp, 22 figs & 4 pls [Numerous refs] 1954 London H M Stationery Office [3s]

* * *

Research on dust sampling problems has continued in co-operation with other bodies Observations on the deposition of dust particles of respirable size show that it is possible to measure the total amount of such dust produced by any mining operation comparatively simply. Instruments on the inbye and return sides of an operation will measure the difference in airborne concentration caused by the operation.

...ould suitable for the bulk collection of airborne mine dust for analysis To maintain the efficiency of the horizontal elutriator it is necessary not only to tilt the inlet downwards so that the plates are at an angle of about 10 degrees to the horizontal, but also to clean the plates at regular intervals of less than one hour.

A study of the dust produced by rotary drilling

and low speed of rotation lead to high efficiency and low dust production Experiments on commercial dry dust traps used with mechanical drills show that these, *if well* maintained, are capable of reducing dust

methylene blue than for coal dust. Hence, the use of methylene blue provides a small safety factor when

suggest that kaolinite dust is more harmful in the lung than a completely inert dust Two lung residues recently examined contained large amounts of kaolinite but showed no quartz. One lung residue came from the United States and the other from Cornwall *An autopsy of the lungs from which the* latter residue was obtained revealed massive fibrosis accompanied by tuberculosis.

Figures are given to show the average amounts of quartz found in the lungs of regular workers in coal mines and of colliers with various grades of lung disease from South Wales, compared with silicotic tin and granite workers from Cornwall. The lungs of colliers contained about as much quartz as those of silicotic tin miners, while those of regular workers in coal mines had more quartz than either.

Analytical and other detailed studies of quartz have revealed an unexpected difficulty. Quartz of fine
phou
lung
anal
cent
X-ra
quartz In animal experiments etched and unetched samples prove equally fibrogenic The amorphous layer on quartz *behaves biologically as if* it were quartz, but a sample which consists entirely of amorphous layer (vitreous silica) is demonstrably less pathogenic in animals. Further research is needed here

Silicosis was originally thought to be caused by the mechanical action of quartz on the lung tissue, but this view was later replaced by a chemical theory, according to which fibrosis was caused by silicic acid solutions Experiments made within the last few years have given results which are not easily reconciled with the solubility theory. Samples of quartz that vary widely in solubility cause identical results in animals, silica solutions do not produce *fibrosis, and different silica modifications* show differences in reaction in spite of equal solubilities. These contradictions between animal experiments and the solubility theory have so far been found only in systems containing silica alone. In mixtures solubility and fibrogenic action seem to be parallel.

The presence of aluminium salts reduces the fibrogenic activity of quartz, and further study of this subject has shown that these salts act in two distinct ways—(a) they react with the silica in solution reducing its concentration, (b) they react directly with the surfaces of the quartz particles reducing their solubility.

Thomas Bedford

MINISTRY OF FUEL AND POWER. **Report of H.M. Inspectors of Mines and Quarries under the Metalliferous Mines Regulation Act 1872, and the Quarries Act 1894 for the Years 1939–1949** [BRYAN, A. M., Chief Inspector]. 38 pp., 1 chart & 9 pls 1950. London: H.M. Stationery Office. [1s. 6d.]

* * *

Efforts to reduce the dust hazard in slate dressing are described. A system of dust extraction by low velocity currents applied close to the point of origin of the dust has been shown to be effective. Continued attention is being given to other pneumoconiosis hazards which come within the scope of Inspectors of Quarries.

Thomas Bedford

MINISTRY OF FUEL AND POWER. **Report of H.M. Inspectors of Mines and Quarries under the Metalliferous Mines Regulation Act 1872, and the Quarries Act 1894 for the Year 1951** [ROBERTS, H. C. W., Chief Inspector]. 26 pp., 3 pls 1953. London: H.M. Stationery Office. [1s 6d.]

MINISTRY OF FUEL AND POWER. **Report of H.M. Inspectors of Mines and Quarries under the Metalliferous Mines Regulation Act 1872, and the Quarries Act 1894 for the Year 1952** [ROBERTS, H. C. W., Chief Inspector]. 30 pp., 6 pls. & 2 figs 1954 London: H.M. Stationery Office [2s.]

* * *

Vigorous attention continues to be directed to the prevention or control of air-borne dust. Extraction plants at sawing tables in mills have effected great reductions in dust concentrations; dust traps and treatment of floors are much used; water-fed drills have been provided in all the Cornish mines where there is dangerous dust, and there are mist projectors for use during blasting.

Thomas Bedford

MINISTRY OF LABOUR AND NATIONAL SERVICE FACTORIES **Annual Report of the Chief Inspector of Factories for the Year 1949** [BARNETT, G. P.]. Cmd 8155 218 pp., 2 figs. 1951 London: H.M. Stationery Office [4s 6d.]

* * *

During the year the number of requests from factory occupiers for dust estimations in order to assess the need for improvements, or to determine the best methods for the protection of workers, increased.

The provision of adequate local exhaust ventilation to remove the dust produced by grinding and polishing machines may cause difficulty on account of the excessive loss of heat when the exhausted air is discharged to the outside atmosphere. A cutlery firm built a large factory in which cutlery was polished on a number of dollies to which a paste containing an abrasive was applied. The fuel costs involved in using local exhaust of normal design were estimated and found to be prohibitive, so experiments were made with a system in which the dust was collected from the exhaust air which was then re-cycled so that air-borne dust would not enter the workroom—the recirculation took place wholly within the plant itself. Tests made with this system and with another plant with local exhaust ventilation of usual type showed that both systems were equally effective. The re-cycling showed much saving of fuel, and was liked by the workers as it caused no cold draughts.

A new technique for estimating the amount of dust in foundry atmospheres was developed by one of the Engineering Inspectors. Little progress is recorded in the removal of dust from knock-outs in non-mechanized foundries. General improvements have been noted in the heating of foundries: the use of open coke braziers has been discouraged. Improvements in the natural lighting of foundries are reported from all over the country, and artificial lighting has been greatly stimulated by the advent of fluorescent lighting.

Attention is being given to the ventilation of foundries. Dust estimations show that much fine dust may exist near traveller crane cabs where there are roof outlets, and this suggests that roof ventilation may be less desirable than the provision o outlets at some optimum height in the side walls.

In the galvanizing industry the process of galvan ing commonly employed in this country has resulted in the discharge of much fume of acid and sal ammoniac, and removal of the fume has been difficult. The adoption of another process by many firms has reduced the amount of fume, while in other factories removal of much of the fume at its point of origin has brought about much improvement.

* * *

There were in all 1,587 deaths from fibrosis of the lung. Silicosis accounted for 575, asbestosis for 17, the pneumoconiosis of coal miners for 420, pneumoconiosis in other industries for 14, byssinosis for 7, and other deaths from non-occupational fibrosis for 554. The total figure compares with 1,544 in 1948. The increase is more than accounted for by an increase of 103 deaths due to the pneumoconiosis of coal miners (from 317 in 1948).

Continued improvement in the lighting, heating and general ventilation of factories is noted.

Statistical tables are given in appendices, and

further appendix deals with accidents in the boot and shoe industry.

Thomas Bedford

MINISTRY OF LABOUR and NATIONAL SERVICE. FACTORIES. **Annual Report of the Chief Inspector of Factories for the Year 1950** [BARNETT, G. P.]. Cmd 8445. 249 pp., 2 figs. 1952. London: H.M. Stationery Office. [6*s* 6*d*.]

* * *

A close watch is being kept on the conditions under which beryllium is being used. One fatal [illegible]

reported

Since 1947 lead glazes, except in a low-solubility glaze, have been forbidden in pottery manufacture and the use of powdered flint has been forbidden for some purposes and restricted for others. Sampling of glazes shows that there has been no difficulty in complying with the regulations Further advances in welfare arrangements in potteries are reported.

Thomas Bedford

MINISTRY OF LABOUR AND NATIONAL SERVICE FACTORIES. **Annual Rep rt of the Chief Inspector of Factories for the Year 1951** [BARNETT, G P] Cmd 8772 232 pp , 2 charts 1953 London H M. Stationery Office [6s 6d]

For some years much attention has been devoted to health conditions in iron foundries, and recent developments are described—valuable progress has been made in connexion with the dust problem

Various problems of ventilation, heating and lighting are discussed, with some examples of attempts at their solution *Thomas Bedford*

MINISTRY OF LABOUR AND NATIONAL SERVICE. FACTORIES **Annual Report of the Chief Inspector of Factories for the Year 1952** [BARNETT, G P.]. Cmd. 9154 239 pp , 5 figs 1954 London: H.M. Stationery Office. [6s 6d]

* * *

Altogether there [illegible]

MINISTRY OF LABOUR AND NATIONAL SERVICE. FACTORIES **Annual Report of the Chief Inspector of Factories for the Year 1953** [BARNETT, G. P.]. Cmd. 9330 257 pp , 5 figs (1 on pl.) [Refs. in footnotes] 1954 London: H M. Stationery Office [6s 6d]

The importance of suitable ventilation, heating, cleanliness and lighting is emphasized Other requirements as to seating, the limitation of heavy weights to be lifted by women and young persons, and the control of their hours of work, are aimed at preventing overstrain and the use of [illegible]

atmosphere of personal relations which can enhance or destroy the sense of well-being that characterizes a healthy person Many small factories offer poor working conditions, yet manage to keep their workers because with a satisfactory psychological background the workers feel that they are members of a team and not merely cogs in a machine Even the most attractive workplace cannot compensate for the loss of recognition as a human being

* * *

Whereas for previous years separate figures are given for deaths from "silicosis" and from "pneumoconiosis" [illegible]

in Scotland [illegible]

pared with 13 in 1952

Thomas Bedford

[illegible]

This report mainly summarizes previously published material [see this *Bulletin*, 1952, v. 27, 166, 756, 938; * 1953, v 28, (31) *bis*, 123, 550, 551; 1954, v. 29, 747], but also outlines some other work. The latter includes:

1 A systematic medical survey of 212 miners who had worked at least 7 years at high temperatures, and a similar continuing survey intended to throw light on the stationary or progressive nature of certain medical conditions Special examinations were carried out on 99 difficult cases.

2. Studies of lung function:

(a) a new quick closed-circuit method of measuring residual lung volume is described;

* pp. 351 *bis*, 300, 352, 126, 343, 335, 340 and 335 respectively.

(b) measurements of curves of inspiration and expiration to detect whether respiration is sufficient or not are outlined.

3 Attention is drawn to 2 improvements of radiographic technique:

(a) an automatic regulator of exposure, operated by an ionization chamber placed between patient and X-ray film;

(b) an improved technique of tomography

4. Field tests on the inhalation of pneumodilator aerosols after work were carried out in 2 important mines. It is claimed that up to the time of writing no untoward effects had been observed. In one mine, the subjects were all volunteers, who reported marked general improvement which was confirmed by physiological tests. In the other mine, all the workers returning from work had to pass down a gallery in which aerosol generators were operating In this case neither the workers' comments nor the results of physiological tests are quoted.

5 Comparative trials of midget impinger and midget scrubber for the taking of dust samples are described The latter is claimed to be more efficient in the capture of particles below 1 micron

6. Laboratory studies of the estimation of free silica in dusts and of noxious gases in air, and of the hygroscopic properties of materials for consolidating settled dusts in mine roadways, are discussed.

7. The rapid diminution of the efficiency of dust and fume extractors with increasing distance between source of fumes and extractor is demonstrated The effect of equipment on the loss of air pressure in mine shafts is mentioned, and a long section describes the study of the distribution of air flow in a network of galleries by electrical means.

8 The progress of studies of the heating of mine air by the surrounding rock, and of the installation of cooling equipment in mine ventilation, are summarized

Although this is described as a report on the activities of the Institute, in a number of instances it provides interesting reviews of work done both there and elsewhere

John McK. Ellison

HOUBERECHTS, A. L'activité de l'Institut d'Hygiène des Mines au cours de l'année 1953. **[The Work of the Institut d'Hygiène des Mines during 1953]** Reprinted from *Ann Mines Belgique* 1954, v. 53, No 3, 31 pp, 22 figs. [44 refs.]

The author summarizes information concerning the activities of the research workers of the Belgian Institut d'Hygiène des Mines carried out in Belgian laboratories and in the coalfield A new travelling X-ray equipment has been acquired for carrying out systematic medical examinations, by which, as time passes, indications may be acquired of the effect of dust upon the lungs, in this matter special attention is being paid to the first-aid and rescue squads, who are being kept under observation by electrocardiogram, and by measurement of temperature variations during exercise, blood pressure, frequency of breathing and weight. Special studies were made of silico-tuberculosis among coal miners and of cardiac conditions Lung efficiency was investigated by means of the improved Douglas-bag technique No certain evidence was found that pneumoconiosis among miners impaired pulmonary efficiency; the observations are summarized in tabular form Fungi found in underground air were examined; nothing harmful was noted.

Much was done in conimetry of air and in getting rid of the dust by water-spray, or by hygroscopic powders, or by agglutinating aerosols The results of these studies are dealt with at some length. Ventilation of deep mines was considered, and means for cooling down the working-face Details of the research work are given for which the original should be consulted.

E. L. Collis

HOUBERECHTS, A. L'activité de l'Institut d'Hygiène des Mines au cours de l'année 1954. **[The Work of the Institut d'Hygiène des Mines (Belgium) during the Year 1954]** Reprinted from *Ann Mines Belgique.* 1955, No. 3, 38 pp, 30 figs [57 refs]

This report gives only a short summary of the research work carried out. Most of the more important work has appeared in separate articles. The first part deals with medical research; pneumoconioses have been studied by radiography of several groups of miners employed at different collieries. Some of the groups had been examined two or more years previously, so the progress of the condition could be followed; but the tendency of the men to move from one mine to another interfered with the research, making it difficult to obtain a sufficiently large number of men for re-examination.

No striking facts emerged Some fine dusts exert a constricting influence on the air-passages which can be counteracted by inhaling pneumodilating aerosols Such aerosols seem to be of more value for individual cases than for group administration A good deal of research was done on the effect of high temperatures in mines upon productivity. The heart action of miners after at least 5 years in hot mines was compared with others. The miners seemed to become used to the temperatures found in Belgian mines. Neither heart action, productivity nor accident frequency were definitely affected. Particular attention was directed to a recurrence of ankylostomiasis, which had nearly disappeared. Whereas only 8 cases were heard of in 1953, during 1954 no less than 54 were discovered; 36 of the cases were in Italians; only 11 were in Belgians Steps are being taken to abolish this disease, as well as to treat it with tetrachlorethylene, as this drug is toxic the treatment should be given in hospital. Enquiry failed to establish that Belgian miners experienced any greater incidence of chronic rheumatism than other men doing heavy work. But advantage might be gained

by teaching them not to adopt bad postures at work and by so improving places of work ... ar ... th ... rst ... cases ... effe ... underground Attention is directed to a new method of injecting water into the coal seams. The use of respirators was studied and the value of ventilation in deep mines The need for cooling underground workplaces was recognized

E L Collis

DAVIES, C. N. **The Separation of Airborne Dust and Particles.** *Arhiv Hig Rada* Zagreb. 1950, v. 1, No 4, 393–427, 19 figs [29 refs.]

This largely mathematical paper reviews and develops the physical theories underlying air purification and dust removal Particles above, say, 20 microns can be removed by sedimentation in air ducts or settling chambers. For smaller particles inertia separators are used in the form of cyclones or scrubbers Their efficiency depends on the ... pattern ...

Apart from inertia separators, filter pads and electrostatic precipitators are used for removal of fine dust. The action of filters is described and formulae are given which cover a wide range of experimental results on flow rates through different filter media, and which allow filtration efficiencies to be calculated

The theory of electrostatic and thermal precipitation is treated in a similar way *G Nagelschmidt*

MAYER, F. W. Die Entstaubungsgradkurve, ihr Wesen und ihre Anwendung auf die Verfeinerung der Gewährleistungen bei Entstaubern **[The Dust Removal Curve. Its Nature and Application to the detailed Analysis of the Performance of Dedusting Appliances]** *Staub* Dusseldorf 1952, Mar. 15, No 28, 15–30, 10 figs (10 refs)

This is a mathematical paper. The curve discussed would be obtained by plotting the proportions removed against their particle size if a material with uniform size distribution were examined It is recommended to choose as fixed point the particle size of which 50 per cent. are removed, and to assess the spread from the interval between the sizes of which 99 per cent are retained or removed

The theory is applicable to many classifying, dedusting and similar processes. The performance of most dedusting machines can be characterized by straight lines if removal as log. probability is plotted against size on a log. scale *G. Nagelschmidt*

MCINTYRE, J T **Engineering Review of Silicosis Prevention.** *Bull Institution Mining & Metallurgy* London 1950, Dec., No 529 (Trans 60), 53–75 [Summary taken from *Bull Inst. Mining & Metallurgy* 1951, Feb., p A242]

This engineering review refers to the change in state of aggregation of those rocks and minerals which give rise to pneumoconiosis in mining and associated industries Dust sampling is reviewed and methods for dust control are examined.

STAUB Dusseldorf 1953, Mar. 15, No. 31, 1–12. Tagung von Sachverstandigen fur die Staubverhutung und Staubbekampfung in Bergbau- und Stollenbetrieben sowie in Steinbruchen in Genf vom 1–17 Dezember 1952. **[Conference of Experts on Dust Prevention and Suppression in Mines and Quarries. Geneva, December 1–17, 1952]**

The conference was organized by the International Labour Organization, Geneva; among the 30 participants ... of ... of ... nat ...

... Gordon

INTERNATIONAL LABOUR OFFICE. ***Meeting of Experts on the Prevention and Suppression of Dust in Mining, Tunnelling and Quarrying (Geneva, 1–17 December, 1952).*** *Occupational Safety & Health*, Geneva 1953, Apr.–June, v 3, No 2, Suppl. 10 pp

The meeting with which this paper is concerned was held at Geneva in December, 1952, under the auspices of the International Labour Office [ILO]

The agenda and composition of the meeting are followed by its technical recommendations "which together may be considered ... code of g... sion of ... These re... tunnellin... for comm... States Me... of the ILO and are expressed in very general terms

The meeting also proposed that the ILO act as an international centre for exchanging inform... an ...

STAUB Dusseldorf. 1953, June 15, No. 32, 103–46 Sicherheitsvorschriften fur gewerbliche Anlagen uber den Schutz gegen gesundheitsschädlichen Staub. **[Safety Regulations for Industrial Installations for Protection against Harmful Dust]**

These are translated extracts (in German) of the (1949) Regulations recommended by the I L O., Geneva

Of all the general regulations only those concerned with fumes, vapours and dusts are given. A table of maximum permissible concentrations for toxic materials as mgm. per cubic metre and for dusts as million particles per cubic metre [identical with particles per cubic centimetre (p p c.c)] seems very similar to American data.

G. Nagelschmidt

SPENCE, J. V. **The Study of Coal Fall and Conveyor-Belt Scavenging.** *Trans. Inst. Mining Engineers* 1951, Feb , v. 110, Pt. 5, 313–25, 15 figs

After coal has been put on the conveyor at the coal-face it is liable to such severe mechanical handling that there is a more or less continuous production of dust When coal is projected from a belt at the transfer point it falls freely, and any dust becomes air-borne More dust is produced by the impact of the falling coal, and impingement of coal against the chute may result in more dust

It was sought to devise a way of pouring mineral on a chute so as to produce a minimum of dust, give minimum degradation, and reduce or remove the need for spraying The investigators set out to provide an undisturbed stream-lined flow of mineral of all sizes, to avoid toppling of coal on transfer from belt to chute, to arrange that the chute should provide speed regulation of the chain of coal so as to give any required delivery velocity, and to provide good delivery velocity Photographs of konimeter samples show the substantial dust reduction achieved

The use of water to allay dust has disadvantages A successful scavenging assembly—rubber scrapers which remove adherent dust from the belt and allow it to fall into garbage bin *via* a hopper—is described The collected dust is sprayed as it falls into the bin

Thomas Bedford

HUDSON, A & WARNER, C. G. **Progress in the Application and Control of Dust Suppression in the South-Western Division.** *Trans Inst Mining Engineers* 1952, Feb , v. 111, Pt 5, 289–300, 4 figs on 4 folding pls

The changes in and development of the organization of dust suppression in this division, since the publication of two earlier reports [this *Bulletin*, 1949, * v 24, 770] are outlined from the point of view of the mines administration These changes have been largely conditioned by changed regulations, and by the need to fit dust-suppression measures into a routine

For sampling the thermal precipitator (T P) is "the final authority", but the more frequent routine survey samples (approximately monthly) are by the P R.U hand-pump filter. Training of personnel, sampling procedure, and the method of presentation of results of hand-pump surveys are described. T.P. sampling and counting technique is also outlined. The manner in which the sampling is planned and the results applied to dust control are summarized, with special reference to the employment of those suffering from pneumoconiosis The results of the various dust-suppression appliances used and recent improvements are reviewed. The importance of combining all methods is stressed

The discussion includes comments on the application of dust sampling to mine conditions, and also some medical comments by Dr. C M. FLETCHER.

J. McK. Ellison

VAN MECHELEN, V. Critères médicaux de l'efficacité de la lutte contre les poussières. **[Medical Criterions for assessing the Efficiency of the Campaign against Dust]** *Arch. Belges Méd. Sociale, Hyg., Méd. du Travail et Méd. Légale.* 1952, Nov., v. 10, No. 9, 416–25. Also published as HASSELT · INSTITUT D'HYGIÈNE DES MINES. Communication No 102. Service Gén./193 Médical. 1952, Dec. 20, 9 mimeographed pp

Many physical factors go to the determination of pneumoconioses ; the size of the particles of dust ; the number of particles per cub. m of air : the proportion of silica in the dust ; the humidity of the air ; its temperature , and the presence of extraneous gases But the risk brought about by these factors can only be ascertained by the effect produced on human beings, which can only be determined by medical examination The proof of the danger lies in the pulmonary activity. Unfortunately clinical examinations alone are not sufficiently delicate to detect the earliest start of trouble Reliance must be placed on radiography carried out systematically on engagement and periodically thereafter. Compensation claims and mortality statistics may be invaluable in establishing the existence of this occupational risk ; but the value of periodical examinations for estimating that the risk continues or has been minimized cannot be gainsaid

The author has devised a scheme of his own for recording the findings of each examination, stated against previous findings together with the dust-hazard experienced at work Changes in the stages of pneumoconiosis found then indicate how far any changes aimed at reducing the dust exposure have been effective Only if the number of cases grows smaller and smaller year by year, and if the time before the appearance of any sign of pneumoconiosis grows longer, can we be convinced that the fight is being successful A table is given to show for 103 miners how this scheme of recording findings has been used by him Each periodical examination should be clinical, with spirometry and measurement of exertional capacity, as well as radiographical.

E. L. Collis

* v II, 404

HASSELT: INSTITUT D'HYGIÈNE DES MINES Gén / 153 Communication No 80 La lutte contre les poussières dans les charbonnages belges Situation au début de l'année 1951 **[Dust Control in Belgian Coal Mines]** [HOUBERECHTS, A., Director]. 9 mimeographed pp.

A tabular statement is given of the number of Belgian mines using various methods of dust control or of personal protection against dust at the beginning of 1951, and another table gives a comparison of these numbers with the corresponding figures for 1946, 1948, and 1950 Yet another table shows the

graphed pp

This report outlines the progress in dust suppression measures in Belgian coalmines during 1952 Much of the data is summarized in tables

Mask filters are steadily disappearing and masks supplying compressed air are no longer in use Wet drilling has become more common, and is generally preferred by the workers. Dry drilling with suction units is advocated only in certain special conditions Shot-firing between shifts is increasing Dust and fume suppression by withdrawal of air at the face is discussed. Spraying of chutes has been extended, but otherwise spraying has diminished. Other wet methods, and in particular the injection of water into seams, have increased, the latter is the only method which does not impede the face-worker The reasons why certain methods of dust suppression are not applicable are enumerated *John McK. Ellison*

HASSELT · INSTITUT D'HYGIÈNE DES MINES Communication No 126. La lutte contre les poussières dans les charbonnages belges. Situation au début de l'année 1955 **[The Campaign against Dust in Belgian Coal Mines. Position at the Beginning of 1955]** [DEGUELDRE, G] 1955, Mar 15, v. 10, No 3, 17 + ii mimeographed pp

Colliery companies in Belgium are called upon to render information regarding dust suppression by filling in yearly a form, a copy of which is given in an appendix. The information so collected is now published, embodied in a series of tables They tell ... dust control is being advanced by using ... methods when loading coal underground, by wet ... by capturing the dust when it is generated ... damping underground passages, or using hygroscopic salt on them The practice regarding shot-firing and return to work thereafter is also described.

A report of this kind is prepared every year. It indicates that on the whole improvement has taken place, but the point is still stressed that more must be done to bring all dust under safe control.

E L. Collis

LANDWEHR, M ... kämpfung ... Bergbau ... and Resea ... *Bergbau Rundschau*, [illegible], Nov. & Dec., v. 2, Nos 11 & 12, 485–91, 542–9, 34 figs

The number of new cases of silicosis in the Ruhr is equal to that of all accidents together, this acts as a powerful incentive for dust control The most effective way of preventing dust disease is to prevent

So far no case of silicosis has been found among the men who started work after that year Dust filter masks may have a limited use under very specialized conditions, but they are no substitute for dust suppression

preferable to dry methods as the removal of the sludge

Dust control must be checked by adequate measuring techniques, and in this article modern apparatus is reviewed and described Gravimetric methods have the drawback that the results depend mainly on the coarsest particles Konimeter, impinger and thermal precipitator results are evaluated by microscope counts These instruments and the tyndallometer and nephelometer are described

the visible impression

Dust control measures are discussed separately for

upwards drilling various types of dust extractors are described; the dust is either collected in paper bags where effective suction must be employed when changing from one bag to another, or the dust is converted into a sludge after collection and in this case clogging up of the filter must be avoided Even if dry drilling is used, piped water should be available to control dust during other operations

To reduce dust after shot-firing, it is best to have exhaust ventilation and to remove the dust through a special duct so that the men can work and travel in fresh air. If blowing ventilation is used, mists are recommended as traps and in this case it is important not to have more air than is required to produce the mist curtain According to the air speed, 50 to 80 per cent of the dust produced in blasting can be trapped in this way. The use of foam is undesirable as it prevents fine particles from being wetted

Water infusion has been introduced in a number of pits and is largely successful and liked by the men It makes coal mining easier and reduces dust by about 80 per cent.

Difficulties may be experienced in very steep seams or under weak roof conditions Wet picks and road consolidation, usually with salt, are gradually coming into use As a result of favourable laboratory studies, the use of wetting agents with the water used in trapping dust after shot-firing was tried but found to be disappointing as less dust was trapped than with water alone. This is probably due to the foaming action of the wetting agents

Much dust is produced in stowing, especially in hand stowing, and a thorough wetting of the material to be stowed is a remedy. Dust control in dead ends is difficult, especially as the dry dust extractors used in drilling are difficult to use in such places and are disliked by the men. Pneumatic stowing, especially if it is intermittent, may produce much dust, and washery refuse or shale only should be used in this process; it is also advisable to introduce a water hose into the blower No remedy has so far been found against dust produced in rock caving. Limestone only should be used in stone-dusting roadways

The transport of dust in air is discussed and illustrated by micro-photographs Plate-shaped particles are carried further than spherical ones and a dust may change in composition as it travels with the ventilation current Thus, in a metal mine, the quartz percentage of the air-borne dust fell from 31 per cent to 19 per cent over a distance of 12 yards

Ventilation is very important. By changing over from blowing to exhaust ventilation on a separate part of a colliery, a dust reduction of 90 per cent was achieved Natural ventilation (by diffusion) alone is never satisfactory but too high air velocities equally are undesirable as they may raise settled dust.

The rest of the paper deals with the effect of dust composition on silicosis risk; the more quartz and the less calcium carbonate, the higher the risk Studies of dust production of different rock types, with the aid of a tumble mill and a plastograph, are described. The plastograph records power and time required to crush a screened rock fraction to fine dust. The results are, generally speaking, that the harder the rock, the more fine dust is produced in crushing or grinding it. Preliminary results suggest that rotary drilling is not necessarily superior to percussive drilling on the same type of rock. Although more coarse material is produced an extrapolation of cumulative size distribution curves suggests that a rotary drill produced 9 per cent by weight of material below 5 microns as against 5 per cent. for a percussive drill.

The author mentions use of X-ray diffraction and electron microscopy in dust research and the possibility of coagulating dusts by adding particles of opposite electric charge or by ultra-sonics

G. Nagelschmidt

MORHENN, E. **Dust Suppression in German Mines.** *Occupational Safety & Health.* Geneva. 1953, Apr -June, v. 3, No. 2, 55-66, 5 figs

During the past 20 years the annual number of newly compensated cases of silicosis in Germany has increased almost without interruption The increase has been largely confined to workers in coal mines, and in particular to those at production faces Consequently new regulations were issued in 1950

Dust suppression. As a result, dust suppression has improved technically, and miners have become interested in it. Working methods have been adapted, for example by avoiding large drops in coal conveying, and closed mine cars have been provided for transport to and from work. All dust suppression equipment requires authorization and is subjected to thorough and expert critical examination under working conditions before this is granted. Respirators are disappearing from use, although compressed air respirators are on trial. The most widespread methods employed suppress dust at its source. Dry exhaust methods are gaining from wet, but the provision of water mains is compulsory in many types of workplace: fog sprays are used during shot firing and reduce fine dusts by 80 per cent., working faces must be sprayed, and spraying is used in transport An improved type of spray is described. The addition of wetting agents offers no advantage over pure water, but salt-strewing and water infusion are highly effective The avoidance of too high and too low air velocities in ventilation, and of long air circuits also reduces airborne dust The inhalation of fine calcium sulphate dust at the end of a shift, and its introduction into ventilating air, are being tested, but so far without conclusive results

Dust sampling The importance of dust sampling in relation to the various mining operations and techniques is stressed Too many factors are involved t[o] permit any simple synthetic assessment of dus[t] hazards. In 1949, however, the specifications f[or] routine dust measuring instrument were issued [...] that the progress of dust suppression might be followe[d] The Leitz tyndalloscope with attachment and t[he] H/S konimeter meet the requirements The form[er] is a development of the tyndallometer [see t[he] *Bulletin*, 1954, v. 29, 1068] Its continuous use [in] some mines has given useful information concern

* p. 303.

mine practice, and has had "a highly educative effect upon everyone concerned"

Medical examination Stringent examination is carried out before employment, and there are subsequent periodical examinations at the request of doctor, management or miner At both of these, [illegible]

Mor [illegible]

rep., v. 3, No. 2, 62–4, 1 fig.

The paper discusses the coagulation of dust particles of size below 10 microns by ultrasonics It [illegible]

[illegible]

be exercised in introducing such methods, because the biological effects on men underground are not sufficiently known *G Nagelschmidt*

FORBES, J. J., FRANKLIN, R. K & REESE, S T **Review of Dust-allaying Practices at Working Faces in some Bituminous Coal and Lignite Mines.** *U.S. Bur Min. Inform Circ. 7566.* Wash 1950, May, 29 pp

A factual study of dust-allaying practices at the working faces of 1,637 bituminous coal and lignite mines in the U S.A The data are presented in tabular form.

GREENWALD, H P [Compiled by] **Proceedings: Fifth International Conference of Directors of Mine Safety Research.** *U S Bur Min Bull 439* Wash 1950, pp vii + 233, 100 figs

[illegible]

In a paper on control of [illegible]

measures for allaying dust Air-borne bituminous coal dust from mines in Pennsylvania averages about 65 per cent of particles 0 5 μ or less in diameter, about 30 per cent 0 5 to 1 0 μ, 4 to 9 per cent. 1–2 μ and the remainder over 3 μ. The permissible limits are based on the percentage content of free silica, on the supposition that men can work in relative safety in atmospheres containing not more than 5 million particles per cubic foot of air; thus 50 million particles per cubic foot of dust containing 10 per cent of free silica would be considered safe However, no concentration of dust should exceed 50 million particles per cubic foot in anthracite mines as a maximum, since this constitutes a dusty atmosphere The average exposure for any workman should not exceed 20 million particles per cubic foot over an entire shift, and the concentration for any one operation should not exceed 40 millions per cubic foot, tests have shown that, if proper attention is given to allaying dust, these standards can be maintained The equipment for allaying dust and the technique for using wetting agents are described

In a paper on tests and investigations carried out by the Health Branch of the Bureau of Mines H H SCHRENK describes the work of the Branch on [illegible]

URBAN, E C J **The Control of certain Health Hazards encountered in Underground Metal Mines.** *Amer Indust Hyg Ass Quarterly.* 1950, Dec, v 11, No 4, 201–5, 1 fig

In metal mining the main health hazard is the inhalation of dusts containing free silica Other hazards depend on the nature of the ores extracted, excessive concentration of gases and smoke due to blasting, deficiency of oxygen, and excessive levels of carbon dioxide, methane, temperature and humidity

Essentials for ensuring safe underground atmospheres include good general ventilation, planned air distribution, provisions for the removal of smoke and exhaust air with exposure of the smallest possible number of men, and auxiliary ventilation of dead-end workplaces These are as necessary as regulated blasting, the use of water to allay dust, the use of respirators, education in good dust-prevention practices, and the frequent inspection and examination of working environment

The author describes work done by the Saranac Laboratory in metal mines in the Adirondacks and in the region of Lake Superior over a period of more than ten years In these mines the free-silica content of the rocks varies from 6 to 60 per cent.

Ventilation of a mine by natural means is generally unsatisfactory, and practically all are ventilated

mechanically. At three mines in the Adirondacks, where the system of working is open stopes with supporting pillars in ore deposits in a massive continuous vein, a method of natural air-conditioning and ventilation, similar to that used in Canada, is made possible by cold winter weather Surface water is allowed to accumulate in the old stoped-out areas close to the surface through which the mine air supply is passed. During winter the cold entering air chills and freezes the stored water, and in summer the entering air is cooled by contact with the melting ice Continual air supplies of large volume are produced, and the temperatures in the workings range from 60° to 70°F

Some ventilation codes ask for the provision of as little as 100 or 200 cu ft of air per man per minute The author gives details of examinations of a number of mines, and concludes that the minimum requirement for adequate mine ventilation is 500 cu ft per man per minute

Efforts at dust control have given good results. Average data for a group of 12 iron-ore mines are plotted, and they show that from 1934 to 1949 the average dust level has been reduced from about 17 or 18 million particles per cu ft to less than 5 million particles—which latter figure is the present permissible level for developments in rock.

Thomas Bedford

WALTER, E. Die Entstaubung der Schotter- und Splittwerke in der Hartstein-Industrie. **[Dust Removal in Gravel and Chip Works in the Hard Stone Industry]** *Staub* Düsseldorf. 1954, June 15, No 36, 252–9, 5 figs.

The technical and economic problems of selection of dust removal methods are discussed. Expensive equipment may appear attractive if the product is thereby improved or a marketable by-product made available, though in the latter case dry methods are usually necessary. Several representative German installations are mentioned and performance figures quoted.

R L. Gordon

KOHLMEIER, C Staubschutz in Grauwackesteinbrüchen **[Dust Control in Sandstone Quarries]** *Staub* Düsseldorf 1950, Dec 15, No 23, 457–61, 6 figs.

This short note deals with silicosis control in sandstone quarries where the bulk of the workers are engaged in making road- or building blocks. The three reasons chiefly said to be responsible for the disease are unsuitable position of the worker, bad ventilation due to bad design of the protective huts in which the men sit, and lack of efficient dust masks Remedies for all three are detailed, suitable dimensions and designs of seats and of huts being given A number of new dust respirators are described; these are said to be efficient, but no test data are given.

G. Nagelschmidt

PIVONT, G. & LAURENT, J. Contrôles des concentrations de poussières sur les lieux de travail aux mines d'or de Kilo-Motò. **[Control of Concentrations of Dust in Work-Places of the Gold Mines of Kilo-Moto]** *Arch. Belges Méd Sociale, Hyg., Méd du Travail et Méd. Légale.* 1955, Jan., v. 13, No. 1, 44–51.

Some account is given of steps taken to ensure the health of miners employed below ground in the gold-mines of Kilo-Moto, in the Belgian Congo The plan adopted was borrowed from the gold mines on the Rand, South Africa, aimed in particular against silicosis, since the gold is being mined from rocks containing a high percentage of silica. The drills used have central water supply to prevent the formation of dust as the drills perforate the rocks A water blast comes into play after shot firing to wash down gases and dust The air is sampled by a konimeter for dust particles and by thermal precipitation The aim is that dust particles less than 5 μ in size shall not exceed 200 per cc of air. The human side is attacked through a strict medical examination before work with an X-ray of the chest which is repeated every 6 months. There is a period of apprenticeship of 6 months before going to work underground Great care is taken to exclude tuberculous infection and the families of miners are vaccinated with BCG During the period 1943–53 no case of silicosis has been detected.

E. L Collis

AVERY, R. H. **Recirculation of Cleaned Air from Cast Iron Machining.** *Amer. Indust Hyg Ass. Quarterly.* 1951, Sept, v. 12, No. 3, 130–34, 8 figs

In the machining of cast iron some fine graphite dust (mainly below 10 microns in diameter) is produced and when this is allowed to escape into the atmosphere it constitutes a serious nuisance Some iron dust also becomes air-borne, but its nuisance value is less than that of graphite. Local exhaust ventilation arrangements which have successfully removed the dust dispersed in machining are described and illustrated.

The author describes installations for the collection of the dust removed by exhaust from cast-iron machining rooms. A two-phase collecting assembly was devised First all the heavy material was removed by a centrifugal collector, and then the air, still carrying the finer dust, was passed through a cleaner of the oil-bath type Laboratory tests indicated an overall efficiency of 99 per cent The collecting efficiency of the oil-bath air cleaner was about 50 per cent for particles of 2 microns diameter, 90 per cent for those of 8 or 9 microns, and 99 per cent for particles of 20 microns. Ten assemblies were built and put into operation and field tests showed that with mass concentrations of dust, at the inlet to the cleaner, of 0 72 to 0 15 grain per cubic foot, the outlet concentrations were only 0 00034 to 0 00098 grain per cubic foot

[illegible]

cubic foot

It is concluded that with the system described, [illegible]

units that have been in operation for a whole year with any extended time of inactivity for purposes of overhaul It is remarked that with installations of this type exhaust ventilation would not probably be used if recirculation were not permissible, owing to the large volumes of air necessary to control the dust nuisance It is also remarked that equipment comparable to that described should be equally efficient in cleaning the air removed by exhaust from operations such as grinding, polishing and belt-sanding *Thomas Bedford*

CONRAD, W. Kann der Natursandstein in der *Metallschleiferei endgultig verschwinden?* **[Can Sandstone be Replaced in Metal Grinding?]** *Staub*, Dusseldorf 1953, June 15, No 32, 173-5, 3 figs

[illegible]

where long saws are ground on special very large sandstones [illegible]

COUCHMAN, C E. & BORCHERDING, C. H. **Dust Control in the Asphalt Street Paving Industry.** *Baltimore Health News.* 1951, Feb., v. 28, No. 2, 84-7.

No information [illegible]

neighbourhood of factories where the materials are being prepared, that the atmosphere is being polluted. Control of the dust is needed to prevent such pollution, as well as to minimize the exposure of workers in the factories. Different methods are used in the different factories; two used wet centrifugal collectors to replace cyclone collectors, with a reduction of complaints from the neighbourhoods. These new collectors can capture the fine stone dust in bituminous concrete of particle size down to 1 micron. Three other factories were using dry centrifugal collectors which do not seem to be so effective for fine dust smaller than 25 μ Another factory made its own water and steam scrubber for collecting the dust [illegible]

LAWRIE, W B **Practical Aspects of Industrial Dust Suppression.** *Brit J. Indust Safety.* 1951, v 2, No 18, 75-83, 3 figs

If the best results are to be derived from dust control measures in a factory, local exhaust and general ventilation must be considered together The evolution of dust should be prevented as far as possible, and the local exhaust ventilation then designed With effective local exhaust there will be relatively little dust to be removed by the general ventilation so that capital costs and heating cost will both be reduced

Dust-producing processes should be housed in buildings that have been designed to make ventilation easy—much stress is laid on this When the processes involve furnaces or other sources of heat the roof should be well insulated so that mechanical extraction from the roof is more efficient

General ventilation should not be considered until all aspects of the dust or fume production have been [illegible]

ventilated downwards towards the floor This method is being increasingly used in Sweden

The principles of local exhaust ventilation are discussed Promising results have been given by the use of very high velocity air curtains which operate on small air volumes

Recent developments in the study of exhaust systems include the use of a cine-camera for observing the aerodynamics of the system, and this method has shown that exhaust hoods may extract air but yet fail to remove the dust

This stimulating paper, by an author who is making valuable studies of dust control in industry, deserves careful attention *Thomas Bedford*

SHERWOOD, R J **The Technique of Dust Elimination in Workshops.** *Brit. J. Indust. Safety* 1953, v 2, No 25, 234-9, 4 figs.

Dust is solid matter divided into fine particles; particles smaller than 1 micron are classified as smokes or aerosols. Some dusts are toxic; others, like coal

and flour, are explosive in air; all are irritating nuisances More and more rapidly-running machinery means more and more far-flung dust. The suppression and control of dust are engineering problems Damped materials do not give off dusts. Water sprays bring down dusts, but aerosols may escape. Work with

skill in designing hoods and ducts, bringing the draughts to the desired places Examples are explained and illustrated for draughts applied to grinding wheels and pedestal grinders, for colliery waggon tippers and for cement kilns If dust is of

paddle type washers, washing towers or atomizers. Dry separation is the most usual and the cheapest method, but when all else fails, and for the lowest dust sizes, electrostatic collectors are the most efficient of all The industrial physician should be acquainted with the principles underlying dust collection and disposal; but the application of these principles is essentially the work of engineers. *E. L Collis*

OWSIANY, W. *Mit Trocken-Absaugegerät Königsborn gegen Silikose.* **[Using a Dry Suction Apparatus to combat Silicosis]** *Bergb Rdsch.* Bochum. 1951, Mar., v. 3, No. 3, 119-20, 2 figs. & 1 diagram.

The article describes and illustrates the use of this dust extractor which is used in pneumatic drilling. It is a kind of vacuum cleaner which sucks the dust produced in drilling through bores immediately below the crown of the drill into a large container where the dust is deposited. The air is filtered through several layers of fabric and discharged into the working room. The suction is produced by a compressed air injector. The dust is either caught dry in a large paper bag suitable to hold about 80 feet

and it can be used in a horizontal position in ... development ends A greater use of this dust extractor is recommended. *G. Nagelschmidt*

ASQUITH, S R, BROOMHEAD, G & BURDEKIN, J T **The Dust produced by Rotary Drilling Machines. Part I.** S...
[Portobell...
No 55
& 4 pls [15 ...]

The amount of air-borne dust produced by rotary drilling machines may be affected by several variable factors The effect of changing 3 of these, namely the speed of the revolution, the rate of penetration and the state and wear of the drill bit have been investigated under controlled conditions when the machine, working dry, was operating in sandstone rock Three different values of each variable were tested in the 27 combinations The dust produced was measured by thermal precipitators which remained in operation during the whole of the period required to drill 4 holes each 65 inches, i.e., a distance of about 21 feet. Some observations were also made

a high value thrust *A. T Doig*

PANCHERI, G. L'aspirazione delle polveri in miniera con l'apparecchio Borsari. **[The Borsari Apparatus for Dust Extraction in Mines]** *Rass. Med Indust* Turin. 1950, Sept.-Oct., v. 19, No. 5, 217-24, 7 figs.

Borsari makes use of the air pressure which is

Borsari apparatus during the drilling the local atmosphere showed 12,000 to 14,000 particles of dust per cc.

Some of the dust within the mine shaft is raised by workers' movements or it is due to causes other than the drilling Borsari has found that this portion of the atmospheric dust content can be considerably reduced by spraying water to moisten the floor and sides of the mine shafts; by this means, he obtained readings which were as low as 133 particles per cc. before drilling was commenced.

[The principles of the apparatus and the layout of the mine are made clear by diagrams and other illustrations.]

J. Cauchi

FANCHERI, G. Nuovi perfezionamenti dell'apparecchio Borsari per l'aspirazione delle polveri al martello pneumatico. [**New Improvements to the Borsari Outfit for the Removal of Dust in Pneumatic Drilling**] *Rass. Med Indust.* Turin 1953, Jan.–Feb., v. 22, No. 1, 28-33, 5 figs.

The author has described the outfit and given evidence of its efficiency in a previous paper [this *Bulletin*, 1951, v. 26, 780]. Various modifications have now been made which have more than halved the [illegible] in a very restricted space

Figures of dust analysis and other test data are given in evidence of the efficiency of the improved outfit. *J. Cauchi*

HASSELT INSTITUT D'HYGIÈNE DES MINES Gén /183 [illegible]

The report gives a short account of tests of the Borsari dust-trap for use with mining drills The apparatus consists of the trapping head, which is fixed to the drill, a compressed air ejector and a filter The ejector, which provides the suction necessary for drawing the dust into the trap, is meant to utilize the exhaust air from the drill, but in these trials some experiments were made by feeding the ejector with compressed air direct from the air supply line The filter contains a series of layers of fabric Any dust which escapes entrapment in this filter is retained by a bed of horse-hair or of steel wool soaked in oil Some other trials were made without the dust-trap.

The use of the dust-trap caused a reduction in the dust concentration, a short distance from the driller, of the order of 95–97 per cent *Thomas Bedford*

HASSELT: INSTITUT D'HYGIÈNE DES MINES Gen /206 [illegible]

In the use of conventional pneumatic picks dust is raised by the air exhaust. To prevent this, in the tool tested, the spent air was directed away from the rock being drilled. In the tests described, various types of measurement of dust concentrations were made during drilling by picks (1) with conventional exhaust and (2) with exhaust directed away from the rock face Under different working conditions measurements of mass concentration with the different [illegible] cent. or more In those experiments in which picks fitted with water sprays as well as directed exhausts were used, the reduction was even more marked, but no indication is given as to how far this would be achieved by means of spray alone

John McK. Ellison

* See above

BROWN, C E **Size of Cuttings produced by Pneumatic Drilling with different Kinds of Detachable Bits.** *Arch Indust Hyg & Occupational Med.* Chicago. 1951, Aug., v 4, No. 2, 103–18, 5 figs. [*Refs in footnotes*]

Data are here submitted to analysis relating to the size of cuttings produced by wet drilling into quartz monzonite with an automatic stoper equipped with 4 kinds of double-taper, centre-hole, and detachable bits The size of the cuttings was determined by sieving and microscopic measurements The mass median diameters of six samples of cuttings, as determined by sieving, ranged from 180 to 250 microns, [illegible] particles of silica of hygienic importance) was determined by extrapolation of the sieving data and [illegible]

E. L. Collis

GESSNER H & BÜHLER, H Die Staubbildung beim Nassbohren [**Dust Production in Wet Drilling**] *Staub* Dusseldorf 1953, No. 33, 257-83, 5 figs.

Three general types of percussive drill have been investigated (1) in which air cannot be blown into the drill hole mixed with water, (2) in which air may under certain circumstances be blown in, (3) in which water mixed with air is regularly blown in Tests were carried out by drilling into a block of granite

Dust samples were taken at 1 m. and 2 m from the drill at the height of a miner's head, by an oscillating filter method; the dust concentration and particle-size distribution were determined. Five types of machine were tested

Details of experimental results are given, from these the following conclusions are drawn The dust concentrations produced by the various wet drilling machines are similar (the fractions by weight under 5 μ and under 2 μ also show only small variations) If a certain minimum water flow (different for different machines) is not employed the dust concentration rises significantly; the present practice of dry-drilling the first half-inch or so of a hole also leads to significantly greater dust production and should be discontinued. From the point of view of the silicosis hazard, the use of wet drills in granite, with poor or non-existent ventilation, produces conditions said to be intermediate between "harmless" and "possibly harmful" (dust concentrations of the order of 10 gm./m.³ below 10 μ). These figures refer to the operation of single drills, however, the use of more than one in a working area naturally causes a higher total dust concentration, and this is still true where ventilation is adequate

R L Gordon

BLUNT, J **Dust Suppression in Yorkshire. A Symposium of Dust-Suppression Measures taken at Four Collieries by** ATKINSON, J., SHAW, C. M. R., BAXTER, G. & MULLINS, C. R. **Part I. Rockingham Colliery** [ATKINSON] *Iron Coal Trades Rev.* 1950, May 12, v. 160, 1061–6, 7 figs. **Part II. Cortonwood Colliery** [SHAW]. *Ibid*, May 19, 1107–11, 7 figs. **Part III. Frickley Colliery** [BAXTER]. *Ibid*, May 26, 1181–5, 9 figs. **Part IV. Park Mill Colliery** [MULLINS] *Ibid*, June 2, 1221–5, 4 figs.

This symposium is meant to record examples of the great amount of work on dust suppression that has been done in Yorkshire coal mines recently

In Part I, J. ATKINSON describes the results obtained at Rockingham Colliery by the application of water by spraying, and by the use of a "poker". The district in which the trial was carried out is worked by advancing longwall, with single-unit belt conveyors, with coal cutters which cut to a depth of 6 ft in the dirt band near the middle of the seam. Shot-holes are bored in both top and bottom sections of the seam After blasting the coal is hand-loaded on to face belt conveyors, these discharge on to gate conveyors which in turn connect with the trunk conveyor. At the outset dust was so dense at the loading point that loaders had to wear respirators and could not see clearly the tub being loaded A survey with the PRU hand-pump showed an average dust concentration throughout the district of 6,500 particles per cc., with 5,000 particles per cc at the loading point. Konimeter samples were also taken, and typical enlargements of konimeter records are shown It was decided to use water to suppress the dust, and pipes were laid to supply the water at 400 lb. pressure. Sprays with canopies were installed at loading and transfer points These did not give as great a reduction of dust as was desired, so it was decided to spray the coal at the face after shot firing. An immediate improvement was noted when spraying was done early in the night shift. PRU hand-pump sample showed an average count of 2,500 particles per cc. in the district, with only 125 particles per cc. at the loading point. When spraying was also done in mid-shift the average count for the district was reduced to 900 particles per cc. With hand-spraying of the coal only the surface of the shot coal was reached. An attachment rather like a gas poker was made to be attached to the hose and inserted into every accessible crevice in the broken-down shot cut, and in the broken-down shot coal. With an improved form of poker in use the average dust count for the district was reduced to only 350 particles per cc. The amount of water used was 4 gallons per ton of coal, and this had little or no effect on the floor of the seam, or on the atmospheric humidity.

C. M. R SHAW describes in Part II the advantages reaped at Cortonwood Colliery from the application of wet cutting of the coal and the use of water sprays at loading and transfer points. In the dust surveys much help was given by the Medical Research Council's Pneumokoniosis Research Unit. Graphs are given which show for the whole of the morning shift the dust counts, on two faces, before and after the introduction of wet-cutting, and photomicrographs of konimeter spots show spectacular reductions in dust with wet-cutting.

At Frickley Colliery water infusion of the coalface was done in the Barnsley Seam, and the results obtained are described by G. BAXTER in Part III. Holes were bored 9 ft. apart, to a depth of 5 ft, a 4 ft infusion tube was used, and water at a pressure of 80 to 300 lb. was supplied. The effect of substituting wet-cutting of the coal instead of dry cutting was also studied. The PRU hand-pump was used, along with the konimeter, for dust sampling On the coal-cutting shift, when there was no water infusion and the coal was cut dry, the average dust count was 865 particles per cc.; with wet-cutting and no infusion, the count was 448 particles per cc.; with dry-cutting and water infusion of the face, it was 551 particles; and when water was infused and wet cutting was done, the count was only 262 particles per cc On the filling shift the comparable counts were 660 particles per cc. with dry cutting and no infusion; 432 with wet cutting and no infusion; 386 with infusion and dry-cutting; and 365 with both infusion and wet-cutting. The amount of water used was about 3 gals. per ton of coal.

Finally, in Part IV, C. R. MULLINS describes the results achieved at Park Mill Colliery with fo[…] boring and wet boring in stone drifts. The foa[…] boring was done with the "Pyrene" dust-allayin[…] unit, and the wet-boring with "Holman" air legs. The rock in the drift had a fairly high percentage of silica. On the day shift, shot holes were bored and

fired, the sides and face were dressed, and girders set On the afternoon shift, débris was filled on to conveyors, and supplies were brought in. Detailed descriptions are given of the dust-allaying appliances used. With dry boring, konimeter samples yielded dust counts of the order of 2,000 to 3,000 particles per cc, and with foam boring the average count was only 410 particles In the trials of the Holman appliance, dry-boring resulted in dust counts of well over 1,000 particles per cc, and the wet-boring reduced the count to 380 particles per cc

Thomas Bedford

HASSELT: INSTITUT D'HYGIÈNE DES MINES. Gén./157. Communication No 82. Lutte contre les poussières Essais d'injection d'eau en veine et d'utilisation de marteaux à pulverisation d'eau aux charbonnages André Dumont **[Trials of the Injection of Water and the Use of Water Atomizers in the André Dumont Mines]** [HOUBERECHTS, A, Director]. 8 mimeographed pp, 1 fig

Four sets of trials were made. (a) with dry working; (b) dust-allaying with atomizers, (c) allaying by water infusion but no atomizers; and (d) with atomizers as well as water infusion Dust estimations were made with ...

the dust liberated by the breaking down of the coal, and the results given by the two methods are additive.

On the basis of thermal precipitator counts, the atomizers alone effected a 33 per cent reduction in dust below the level with dry working, water infusion alone gave a 46 per cent reduction, and the two methods used together brought about a reduction of 65 per cent, in the average dust count

Thomas Bedford

HASSELT INSTITUT D'HYGIÈNE DES MINES Gén/ 163 ...

... Seams in Coalmines at Frameries, Belgium] 11 mimeographed pp, 5 figs 1951, July 27.

The experiments described were made in a mine to determine the ...

meas ...

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made ...

impr ...

but ...

concentration by 37 per cent and the solution of wetting agent reduced it by 44 per cent [This difference, tested by the *t*-test, does not appear to be statistically significant] Particle sizes are not stated.

J. McK Ellison

HASSELT INSTITUT D'HYGIÈNE DES MINES. Comm. I Communication No 114 Essais d'une nouvelle technique d'injection d'eau en veine aux Charbonnages de Houthalen **[A New Technique of Water Injection tried in Coal Seams at Houthalen]** [HOUBERECHTS, A & DEGUELDRE, G] 1954, Jan 25, 23 mimeographed pp, 5 figs

This paper describes preliminary tests on the effectiveness for dust suppression of deep injection of water into coal seams

In the method described water is injected into the seam at a depth of 4 to 5 metres This technique requires very much less water than the more usual shallower injection, since the leakage through the cracks produced by the working at the advancing face is minimized The authors claim that the exploratory tests described indicate that the suppression of dust obtained is quite as satisfactory as that by orthodox injection methods, and that deep injection requires no more skill and no more labour They warn against the dangers of applying it in gassy seams

[The data presented do not appear to the abstracter to warrant any but the most tentative conclusions]

J McK Ellison

THOMAE, W. Das Stosstränkverfahren im Steinkohlenbergbau, seine betriebliche und ...

dust measurements were made in conjunction with the Silicosis Research Institute in Bochum. The paper gives a detailed account of the experiences made with water infusion since 1949

The equipment used is briefly described. Water pressure gauges and flowmeters are built together and the outer infusion tube is now made of a light alloy to reduce weight. It is not possible to lay down suitable conditions beforehand, as these have to be found by experiment for every seam or working place The water pressure generally aimed at is of the order of 4 to 7 atmospheres but it may reach 12 in steeply inclined seams Infusion holes were usually made about 20 feet apart. Water consump- ...

night shift, preparatory to coal-getting. Stress is

laid on the difficulty of adequate supervision of such work and on the need for using responsible, experienced people of good intelligence Payment per hole infused may lead to skimpy work and it is better to base payment on the output of the district.

The dust measurements were made with Tyndallometer and konimeter. Detailed evaluation of the results was difficult because the length of the faces worked and other environmental conditions changed during the many months that the work lasted. Horizontal, inclined and nearly vertical seams were infused and for details the original paper should be consulted. The average result was a 75 per cent. reduction of the total dust at the coalface and transfer points, and a 55 per cent. reduction of the fine dust in the return air. Reduction of silicosis risk, based on amount, size and composition of dust, is estimated at 70 per cent.

The health hazard is not the only consideration. Coal getting was easier and more men could work under the improved conditions. Thus the total production was slightly increased as well as the production per man-hour, and the cost of coal-winning, after allowing for materials, etc., was reduced by about 3 per cent. Comments on further possible improvements deal chiefly with instrumentation, dust measurements and the use of wetting agents

G. Nagelschmidt

IRON & COAL TRADES REV. 1950, July 21, v. 161, 133–4, 1 fig. **Coal-Dust Suppression. New NCB Standard Spray Head.**

For producing water sprays for dust reduction in collieries, numerous different spray nozzles are in use. The National Coal Board's Central Research Establishment suggests that standardization is desirable, and a NCB standard spray-head has been designed.

The requirements for a satisfactory spray are set out as

[illegible]

(3) After the mist is formed there should be enough residual pressure to project the spray a reasonable distance against the dispersal influence of air currents

(4) The water consumption of a nozzle should be 1 to 1½ gallon per minute at pressures of 60–150 lb per sq in.

(5) The nozzle should work satisfactorily even if the water supplied is not entirely free from grit.

The NCB spray is said to conform with these requirements, and some numerical data of performance are given. Drawings show the construction and dimensions of the nozzle Good results are achieved even when the pressure is as low as 25 pounds to the square inch.

Thomas Bedford

WARREN, J. W. **Underground Dust Control. The Problem and How One Mining Company Solves It to Maintain a Healthy Atmosphere.** *Mining Congr. J.* Wash. 1950, May, v. 36, No 5, 22–7, 13 figs.

The paper gives a description of the methods of dust control used by the Anaconda Copper Mining Com- [illegible]

value of hygroscopic salts for dust control, but whether the salts are applied dry or in solution it is concluded that their effective life does not warrant their use in general practice Water sprays are widely used for dust control—in dry manways, or the mouths of chutes, and a permanent position in airways and haulageways Many areas of the mine are ventilated by air-conditioning plants which range in capacity from 20,000 to 70,000 cu. ft. of air per minute The dehumidification achieved by the larger plants is very substantial, and in consequence a large amount of dust is removed from the air as it passes through the conditioners—it is estimated that 60 per cent. of the dust entering the plants is deposited there.

Thomas Bedford

SCHMIDT, K. G Über die Ausflockung von Staub im Zusammenhang mit der Aluminiumtherapie bei Silikose **[On the Flocculation of Dust in relation to Aluminium Therapy in Silicosis]** *Staub* Düsseldorf. 1951, Sept 15, No. 26, 287–317, 15 figs [28 refs]

Dust measurements in factories often show very high counts just for the finest dusts, in spite of expensive and complicated dust control measures. Fresh-air ventilation could reduce the dust counts but it is often impracticable on account of the enormous and very expensive heat losses. Dust removal by filtration would be desirable but complete filtration is at present technically impossible It could be greatly simplified if the air-borne dust could be flocculated and thus made easier to filter. Flocculation depends on electrical surface phenomena and the paper reviews crystal structures and surface chemistry of solids on the basis of published information, with the main emphasis on colloid phenomena in aqueous suspensions.

Experiments on flocculation of quartz in water are described which show the well-known effects of ionic charge and *p*H. The exceptional value of trivalent [illegible] flocculation [illegible] as [illegible] ion- [illegible] be the beneficial effect of aluminium in silicosis prophylaxis as a flocculation phenomenon

It is recommended that factories should be sprayed with sulphates or chlorides of iron or aluminium to counteract the silicosis risk. The amount of these salts should be one-tenth by weight of the siliceous

dust, and the salts should be used as 0·025 per cent solutions Therapy by spraying should be continued after the dust exposures have finished, as the protective hydroxide skins of iron or aluminium, which form as a result of the flocculating action, may be dissolved away in the course of time The flocculation of dust in air will form the subject of further communications G *Nagelschmidt*

DAUTREBANDE, L., HIGHMAN, B., ALFORD, W. C., WEAVER, F. L. & THOMPSON, E. C. **Aerosols. IV. Effect of Saline Aerosols on Dust in Atmosphere; Reduction of Dust Deposition in Lungs by Saline Aerosols.** *Occupational Med* Chicago. 1948, May, v. 5, No. 5, 506–21, 9 figs (2 coloured on pls)

Earlier experiments of the authors led them to the conclusion that aerosols of water could aid in the control of the dust hazard The fine watery particles in a [illegible]

In the experiments now reported, aerosols of a 5 to 10 per cent. solution of sodium chloride were used. The air-borne dust was of finely-divided willemite, because even minute particles of this mineral are [illegible]

Thomas Bedford

DAUTREBANDE, L, BECKMANN, H & WALKENHORST, W. **New Investigations on Agglutination of Fine Dust Particles by means of Sodium Chloride Aerosols and Considerations on the Fine Dusts' Problem.** *Beiträge z. Silikose-Forschung* 1953, No 19, 20 pp, frontispiece & 26 figs on 24 pls. [Numerous refs] [Also in German 21 pp & French 23 pp]

This paper is given in English, German and French and is illustrated by 26 figures, mainly electron micrographs of high quality. It gives new experimental data to support Dautrebande's thesis that fine dust is best suppressed by aerosol coagulation Sodium chloride is the most suitable material Previous work had been done with concentrated solutions and the present work describes laboratory experiments with 1 per cent. sodium chloride solutions These are sprayed into a test chamber into which quartz or coal [illegible]

DAUTREBANDE, L, BECKMANN, H & WALKENHORST, W. Neue Untersuchungen an Aerosolen (II Teil). Ergänzende Betrachtungen über den Ablauf der Staubkoagulation durch feinteilige Aerosole in Luft **[New Investigations on Aerosols. II. Further Considerations on the Mechanism of Dust Coagulation by Fine Aerosol Particles in Air]** *Beiträge z Silikose-Forschung* 1953, No. 22, 1–32, 18 figs [13 refs]

In continuation of previous work [this *Bulletin*, 1953, v 28, 718]* this paper consists mainly of a description and discussion of a large number of excellent electron micrographs, including some taken by dark field technique

Most of the work was done by sampling air with an electrostatic precipitator after mixing dust (quartz or coal) and aerosol (salt, calcium chloride [illegible]

The influence of relative humidity was tested next and coagulation was found to take place at both low and high humidities The micrographs suggest that coagulation, especially at high humidities, first takes place in a liquid phase and dust free spaces around larger aggregates suggest the deposition of large droplets on the samples Such droplets are not likely to penetrate to the alveolar tissue

The advantage of using calcium gluconate in similar tests is that this salt always gives spherical particles which can be easily recognized and differentiated from the dust particles in the electron micrographs

G *Nagelschmidt*

DAUTREBANDE, L., BECKMANN, H. & WALKENHORST, W. Neue Untersuchungen an Aerosolen. Beschreibung verschiedener Geräte zur Erzeugung feinster Aerosole **[New Investigations on Aerosols. Description of Different Types of Apparatus for Production of Very Fine Aerosols]** *Beiträge z Silikose Forschung* 1953, No 22, 35–59, 19 figs. [23 refs.]

Aerosols for inhalation or for dust suppression should both consist of uniformly small particles This

* See above.

aim can be achieved if the aerosol is made to pass turbulent liquid layers which retain all larger droplets The article, which is lavishly illustrated, describes a series of aerosol generators of different sizes and designs which all produce, according to electron micrograph tests, size distributions of sodium chloride of the order of 0 05 micron or less

The main constructive design for achieving small particles is to pass the spray through tubes with spherical spaces joined by constrictions Variation in amount is achieved by duplication of jets, and generators with 1 to 48 jets are described. The larger generators are fitted with liquid reservoirs to allow several hours' uninterrupted action, and to counteract the effect of evaporation the spare liquid is less concentrated than the original liquid

The jets in the generators are interchangeable to allow for changes in yield and in air pressure, and the openings in the jets vary between 0 7 and 1 5 mm (1/32" to 1/16") Air pressures vary from 6 kgm / cm ² for the largest machines down to 0 2 kgm /cm ² for single-jet mouth-piece inhalers

G Nagelschmidt

DAUTREBANDE, L , BECKMANN, H & WALKENHORST, W Staubkoagulation durch Kochsalz-Aerosole mit Triathylenglykolzusatz **[Coagulation of Dust by Salt Aerosols containing Triethylene-glycol]** *Beitrage z Silikose-Forschung.* 1954, No 29, 1–16, 9 figs [15 refs]

The authors have previously demonstrated that dust coagulation by salt aerosols takes place in the form of droplets at high relative humidities (over 75 per cent saturation). This was deduced from the appearance of electron microscope illustrations which showed round aggregates of particles with dust-free rims corresponding to the water layers which had vanished At low relative humidities, with coal dust and salt aerosol, this effect was not observed In order to produce it at low relative humidities a mixed spray of sodium chloride (5 or 2 5 per cent.) and triethylene-glycol [TEG] (1 or 2 5 per cent.) was used under the same test conditions as described previously [this *Bulletin*, 1953, v 28, 718, 1954, v 29, 827] *

A number of electron microscope illustrations are shown which demonstrate that with the strongly hygroscopic TEG and coal dust the droplet effect was observed at relative humidities down to 35 per cent

G Nagelschmidt

DAUTREBANDE, L., BECKMANN, H & WALKENHORST, W. Quantitative Ergebnisse der Staubkoagulation bei Aerosolanwendung in einer Steinkohlenzeche **[Quantitative Results of Dust Coagulation when using Aerosols Underground in a Coal Mine]** *Beitrage z Silikose-Forschung.* 1954, No. 31, 1–27, 18 figs.

The paper describes dust measurements taken with and without the release of a salt aerosol which had previously been shown to be effective in laboratory experiments [this *Bulletin*, 1953, v. 28, 718; 1954, † v. 29, 827] The aerosol consisted of 5 per cent. and later 2 per cent sodium chloride solution released at the rate of 800 to 900 cc. per hour from each of 10 generators. Measurements were taken at distances of 15, 120 and 270 yards down-wind. Average ventilation was 160 m³/min. but as the cross-section of the roadway is not given the air speed cannot be assessed

Dust sampling was done with the Midget Scrubber D21, with a thermal precipitator and with another thermal precipitator fitted with a sedimentation tube designed to give a cut-off at 3 μ.

The incoming air was continually monitored for total and fine dust with the aid of a tyndallometer.

It was found that the dust was coarser in the presence than in the absence of aerosols although in terms of mgm./m.³ there was often a slight increase in total dust.

The peak in particle number was shifted from 1 to about 3 μ. Most of the results are shown in the form of cumulative size distributions. Microphotographs illustrate the presence of fine dust inside salt crystals A small effect found experimentally is finally made to look very impressive by operating with a lung retention curve [GESSNER *et al*, this *Bulletin*, 1950, v. 25, 604], ‡ in which retention drops from 100 per cent. at 0 8 μ to 15 per cent. at 5 μ The authors thus come to the conclusion that more than two-thirds of all respirable particles present are converted into non-respirable aggregates by the process

G. Nagelschmidt

HASSELT INSTITUT D'HYGIÈNE DES MINES. Gén / 188 Communication No 100 Lutte contre les poussières Diminution de l'empoussierage dans les chantiers d'abattage et les voies d'entrée d'air par l'emploi de pulvérisateurs en taille Résultats de l'enquête menée par l'Institut d'Hygiène des Mines sur l'efficacité des pulvérisateurs utilisés dans les charbonnages Belges **[Reduction of Dust in Mining Galleries and Airways in Belgium by Means of Atomizers]** [HOUBERECHTS, A., Director] 1952, Nov. 4, 17 mimeographed pp , 50 figs on 25 pls

For some years, water sprays have been used for the reduction of dust on roadways in some mines The authors have studied the efficacy of 53 kinds of atomizers for the allaying of dust They examined them from the standpoint of the requirements of water and eventually of compressed air in terms of the pressures of water and of air; the angle of the jet, the length of throw of the jet; and the nature of the cloud, whether of mist, droplets or drops. The practical result of this examination has been the determination of the use to which a particular atomizer is most fitted, whether for spraying the working face, for suppressing dust after shot-firing, or for damping coal at loading points

The characteristics of the 8 atomizers which were considered to be the best of those examined are tabulated with observations as to the use for which they are most appropriate

Thomas Bedford

* p 339 bis † Ibid.

‡ v II, 365.

HASSELT INSTITUT D'HYGIÈNE DES MINES

mimeographed pp , 4 figs

Experiments were carried out, in a coal mine, to determine whether a fine mist (75 per cent of drops $< 1\mu$) tends to suppress dust clouds Over a period of 27 months, 40 rabbits were exposed at first to normally-occurring coal-dust and subsequently to artificially-produced shale dust (90 per cent $< 5\mu$) The gallery along which the dust passed was divided length-wise by a screen, at one side of which aerosol-generators operated, and 20 rabbits were placed on each side of the screen , in addition, there were five control animals on the surface

Of the physical measurements, only the tyndallometer consistently gave lower readings on the side "with aerosols" Thermal precipitator and jet dust counter, and also autopsy were inconclusive

J McK Ellison

STAUB Dusseldorf 1954, Mar 15, No. 35, 56-65 Schwebstofftechnische Arbeitstagung vom 17.-19 Oktober 1953 veranstaltet von der Schwebstofftechnischen Arbeitsgemeinschaft am Physikalischen Institut der Universitat Mainz **[Conference on Aerosol Technique on 17-19 October 1953 arranged by the Association of Aerosol Technique at the Physical Institute of Mainz University]**

Recognition of the increasing importance of aerosol technique to personal health and economy led to the establishment last year of the Association of Aerosol Technology. The task of the Association is to bring together scientists interested in various aspects of aerosols and, by annual conferences with contributed articles and discussions, to deal with the physical and technical problems of aerosols, especially of the high dispersion and electro-aerosols

At this conference the following aspects of the subject were discussed (a) production of aerosols by atomization etc , (b) technique for measurement of aerosols , (c) characteristics and behaviour of electro-aerosols ; (d) special problems in the application of aerosols in the prevention of pneumoconiosis in coal-mines The conference heard 14 communications with discussions on various aspects of the subject An opening speech by Professor KLUMB, of Mainz, on the necessity for an organized plan of research

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problem of atomization in flame photographic work; stability of electro-aerosols, a light effect on the settling of upper layers of enclosed smoke and mist columns ; a law on the maximal efficiency of centrifugal separation of high dispersion aerosols ; new aspects and possibilities of the production of high dispersion aerosols ; inhalation experiments with various chemicals on workers exposed to a risk of lead poisoning, dust suppression with aerosols in mining, chemico-physical qualities of artificial and natural aerosols ; principles of industrial dust measurement in Ruhr coalmines *E. L. Middleton*

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The paper discusses the practical aspects of the coagulation of fine quartz dust by salt aerosols, advocated by Dautrebande

All aerosols tend to coagulate and the speed of coagulation is proportional to the square of the number of particles Simple calculations show that in order to coagulate dust of a given size in a short time, either 1,000 times the weight of the coagulant of the same size must be used, or a much finer size of coagulant

Attempts to verify these conclusions were made and it was found that very concentrated dust clouds, such as Dautrebande used, can be coagulated by adding equally large amounts of salt. More dilute clouds, however, of the order of 5-15 mgm per cubic metre, were coagulated only a little by salt aerosols. It is concluded that industrial dust control by salt spraying is not likely to be successful *G. Nagelschmidt*

AVY

8 pls & 1 chart

Some laboratory experiments have suggested that dust in the air may be agglutinated and so dispersed by water sprays This question is fully discussed Certainly a shower of rain improves visibility by carrying down atmospheric dust particles, either by condensing on them or causing them to coagulate

tions of sea-salt also come under consideration ; they are no more effective An attempt is made to express mathematically the rate of flocculation which may be obtained, but industrial conditions do not lend themselves to such calculations The conclusions arrived at agree with experience gained in Belgian mines during some 27 months There, a dust concentration of 10 million particles per litre gave no positive result when subjected to an aerosol of 10 per

cent sodium chloride solution of 20,000,000 particles to the litre At present, at any rate, we have no sprays to bring into industrial use. *E. L. Collis*

NELSON, K W **Control of Dusts by Water Mists.** *Arch. Indust Hyg. & Occupational Med.* Chicago. 1951, July, v. 4, No 1, 25–31, 5 figs.

At mills for ore-crushing in the smelting industry dust control is an important problem. Wetting of coarse materials is not enough, and too much water clogs the chutes and screens. Ordinary sprays tend to over-wet and are relatively ineffective Steam envelops and wets dust particles which remain air-borne for considerable distances, but mists of extremely small particles are better, they envelop and wet the particles, and promote rapid settling by increasing the particle size. Atomizing nozzles were installed in a smelter crushing plant at the major sources of dust, they reduced the dust dispersion appreciably. Commercially available pneumatic atomizing nozzles were used to produce the water mists In these nozzles water and air are mixed internally to produce a round, wide-angle round, or flat-spray pattern. The droplets range from about 10 to 50μ in size, the majority being less than 25μ A typical nozzle, producing a good volume of mist for dust suppression, uses 10 8 gallons of water per hour, and 5·3 cubic feet of air per minute Illustrations are shown of dust at crushing processes with and without the spray in action, the alteration in visibility is notable A further advantage was that the surface of the crushed material passing through the mist zone was moistened, but not over-wetted, and so was less dusty in later stages of manipulation. Water mists cost little and are simple to install; but do not rival well-designed exhaust ventilation

E. L. Collis

TARA, S. Corps "Mouillants" et médecine du travail (Note preliminaire.) [**"Wetting Agents" and Industrial Medicine (Preliminary Note)**] *Arch. Malad. Professionnelles.* Paris 1950, v. 11, No. 4, 381–4.

The increasing use of wetting agents in industry as well as in private life gives rise to certain problems which call for study. Wetting agents have, among other properties, that of reducing surface tension when added to liquids; chemically they are sulphonated derivatives of long chain alcohols.

Numerous cases of dermatitis have been seen affecting the hands and arms of persons employed in washing dishes in canteens or restaurants. It was found that the washing water contained a detergent composed of perborate of soda to which a wetting agent had been added, a substance intended for use only in dish-washing machines. Dermatitis was also found among workers engaged in degreasing metal vessels with a solution of carbonate of soda to which a wetting agent was added. The dermatitis in all these cases had no distinguishing characteristics

Another aspect of this question is the effect of the wetting agent on the folliculitis caused by oil and dust; gentle rubbing of the affected area of skin with cotton wool dipped in the wetting agent removed the incrustations on the hair follicles; it is suggested that the addition of a small quantity of a wetting agent to the washing water used by workers exposed to contact with oil would prevent the folliculitis.

A further question is raised by the use of wetting agents with water used to suppress dust in rock drills; what is the action on the blood of these substances when inhaled as aerosols? When tested in a tube with blood the wetting agent was observed to cause rapid haemolysis, and the remains of the erythrocytes had undergone changes in texture and colour reaction; the leucocytes also had become disintegrated. From these and other experiments *in vitro* it appeared that the wetting agent may have a destructive action on blood cells; this point should be cleared up before the use of wetting agents to suppress dust in rock drilling has become general. The authors propose to carry out experiments by exposing animals to the inhalation of aerosols containing substances which reduce surface tension, and to study the effects on the red and white cells of the blood and on the cells of the bone marrow.

E. L. Middleton

CHARBONNIER Etude de produits mouillants. [**Study of Wetting Agents**] *Centre d'Etudes et Recherches des Charbonnages de France.* 1950, June, Note Technique No. 50/4. 5 pp.

The paper summarizes the results of tests made of the efficacy as wetting agents of 19 commercial products

The comparative efficacy was measured in terms of the time necessary for the immersion of coal dust. Better results were got by using river water (pH 7·6) than with distilled water. The concentrations used were such as to make the net cost of the solutions equal On this basis the substance *Entstaubungsmittel V* (Badische Anilin und Soda Fabrik) came out best, but the result is quoted with reserve since it is based on a supposition selling price. Next come two products by Kuhlmann *Ekazol D.40* and *H.40.* The question of their physiological safety is yet to be studied. From this standpoint, Compound M (Johnson-March Corporation), approved by the U.S. Bureau of Mines, is probably quite safe, and it gives a good performance, even on a price basis.

Some tests were also done with some of these wetting agents on dusts of schist and of talc. These substances were wetted very nearly as well as coal.

The choice of wetting agent depends on circumstances The composition of the water used, and especially its pH, affects performance. So does also the nature of the coal.

Thomas Bedford

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The presence of a detergent in water causes dust particles scattered on the surface to fall below the surface instead of floating, the solution penetrates a bed of dust more easily than does water, and the bubbling of air produces a froth which tends to engulf and retain the dust

method With increasing concentration of a wetting agent the surface tension falls rapidly at first and then tends to a value depending on the nature and concentration of the substance studied

The wetting power does not depend only on the

deposited), of the speed of penetration of a drop of

regularly employed at the Institute It appears that a lowering of surface tension by 35 or 36 dynes per cm is a necessary condition for optimum working of these wetting agents in suppression of dust

Reference is made to trials of wetting agents that have been made in Great Britain and Germany

Thomas Bedford

HASSELT · INSTITUT D'HYGIÈNE DES MINES Gén /180 Communication No 95 Lutte contre les poussières Examen comparatif de quelques nouveaux agents mouillants Établissement de critères concernant leur efficacité

Thirty commercial wetting agents of U S, U K and continental origin were tested for. (1) the surface tension of their solutions, and (2) the speed

HASSELT INSTITUT D'HYGIÈNE DES MINES. Comm. VIII Communication No 121. Les produits tensio-actifs et la lutte contre les poussières dans les mines **[Wetting Agents in Dust Control in Mines]** [HOUBERECHTS, A. & DEGUELDRE, G.] 1954, Oct 25, 41 + iii mimeographed pp, 14 figs. [11 refs]

Water is much used for the reduction of dust in mines, but used in excess it brings difficulties of roof control, and of excessive humidity in deep and hot mines To secure better wetting of the dust with less water, wetting agents are now widely used In August and September 1954, at a conference in Paris, deter-

surfaces and its consolidation on roads, *e g*, by wetting agents or by the use of common salt or calcium chloride Two papers were concerned with the sup-

loading

Water infusion of the coal seam was the subject of two papers One author found that the addition of wetting agents to the water used for infusion made no

authors is probably that there was excessive formation of froth.

Four papers were concerned with the use of water sprays from atomizers Trials of the efficacy of wetting agents carried out at loading points by one author gave no evidence that these agents caused better dust suppression, whereas another author found substantial improvement, and the experience of the authors of the present communication was that wetting agents were of value in this application Two other papers dealt with the use of foam in dust suppression

Some findings of the Hasselt Institute on the characteristic physical properties of wetting agents and the results of trials of water infusion and atomization are also described *Thomas Bedford*

HALL, G. C, Jr. **Pulmonary Toxicity of Wetting Agents dispensed as Aerosols.** *Amer. J. Dis. Children* 1950, Sept., v. 80, No 3, 408–12, 3 figs.

Wetting agents have been used by investigators for many purposes related to medicine, but especially as solvents for penicillin aerosols, as agents to wet down dust in mines and as agents to increase moisture in croup tents for children. Although tests for toxicity

have been made, they have been limited to observation of the effects of oral, intravenous or intraperitoneal administration.

The author exposed guineapigs to aerosols containing wetting agents in concentrations of 1·0, 0 5 or 0 1 per cent, for 8 hours each day for 6 days. The animals not dead were killed, and the lungs of all were examined. The wetting agents were Duponol C (sodium lauryl sulphate), Aerosol OS (alkylaryl sulphonate), Tergitol 08 (synthetic primary alcohol sulphate), and Aerosol MA (sulphonated ester of dicarboxylic acid) In every case the dyspnoea exhibited by the animals was in proportion to the concentration of the wetting agent. With 1·0 per cent. all animals were markedly dyspnoeic and 4 of 6 died, with 0 5 per cent. the animals were mildly dyspnoeic, with 0 1 per cent none was dyspnoeic. In the lungs of the severely affected animals there was a high degree of change characterized by infiltration with polymorphonuclear cells and macrophages, proliferation of fibroblasts, desquamation of pulmonary epithelium and proliferation of alveolar epithelium. Large areas of alveoli were completely obliterated.

It seems, therefore, that these substances are toxic in high concentrations, 0 1 per cent. appears to be safe, but should not be exceeded in experimental investigations in man.

Charles Wilcocks

SPIES, H. Die Staubbekämpfung durch das Salzverfahren. **[Dust Control by the 'Salt' Process]** *Glückauf* 1951, *Mar.* 17, *v.* 87, Nos 11/12, 248–53, 3 figs.

The article describes a procedure first developed at the Beeckerwerth colliery in the Ruhr in 1944 which proved successful and is now under test in a number of other German collieries. The object is to keep mine roadways free from dust. This is achieved by covering floor, walls and roof with a layer of salt of about 1¼ inch thickness. This layer is periodically moistened by spraying. Part of the salt dissolves and on crystallizing out again it comes to the surface by efflorescence and consolidates any dust that has settled out in the meantime. The rate of evaporation, and hence the periods between respraying, depend on the rate of flow and the relative humidity of the ventilation current Limiting conditions found by calculation and experiment are given in tabular form If the humidity is too high or the rate of flow too low no evaporation takes place and the process does not work.

Distribution of salt on the floor is simply achieved by raking and requires about 1 cwt. for two square yards (25 kgm /m_2). Application to the walls and roof takes place in two stages, an "undercoat" of finely powdered salt mixed with 5 per cent of $Ca(OH)_2$ is first sprayed on with a "gunniting" (Torkret) machine, and this is followed after a day by spraying on the coarse salt. The moistening of the roadway is done by a mist projector drawn by a locomotive. The salt used is a cheap by-product of the potash industry which contains 70 per cent. or more of NaCl. It may be desirable to add 3 per cent. of $MgCl_2$ to facilitate the uptake of moisture. Experiments are under way to cheapen the process by developing special machinery and to extend its range to more humid mines by using different salts, such as are found in spent sulphite liquor.

The process has been found very successful over a number of years. It is claimed to give protection against explosion, silicosis and fire hazard Stone dusting may be unnecessary if the salt process is used, and experiments to test this are under way.

G. Nagelschmidt

WALTER, E Grundlagen der industriellen Entstaubung. **[Principles of Industrial Dust Removal]** *Staub.* Dusseldorf. 1954, June 15, No. 36, 228–51, 22 figs.

This is a survey of available techniques, written for those concerned with the selection and operation of dust removal equipment. Approximate limits are quoted for dust concentration and size likely to be encountered in practice. Suction apparatus, ventilation, and dust removal methods are discussed; the various filter materials are compared, and electrostatic and ultrasonic methods of removal are mentioned. There are notes on choice of air velocity, and on dust measurement

R. L. Gordon

HEMEON, W. C. L **Exhaust Rates for Dust Control. Theoretical Requirements in Bulk Material Handling Systems.** *Amer Indust Hyg. Ass. Quarterly.* 1954, June, v 15, No 2, 132–5, 4 figs

The author derives an approximate expression for the maximum theoretical rate of air induction due to a stream of falling particles in turbulent motion, such as would be encountered where crushed material, of particle size greater than 2 millimetres, is discharged into a bin from a height considerably in excess of 2 or 3 feet.

D. E Hickish

JARMUSKE, M Fliehkraftentstauber fur Feuerungsabgase. **[Cyclone Cleaning of Chimney Waste Gases]** *Staub.* Düsseldorf 1952, Dec. 15, No 30, 211–20, 3 figs.

The paper discusses performance and testing of cyclones used for cleaning air from industrial chimneys Feifel's theory of vortex decay is used and his proposal to employ small test cyclones is recommended. Some examples of their usefulness in comparison with conventional methods of measuring the performance of cyclone dedusting are given

G Nagelschmidt

MUHLBAD, W. Uber das Niederschlagen von Staub auf nassem Wege mit Hilfe von Venturirohren. **[Wet Removal of Dust with Venturi Tubes]** *Staub.* Dusseldorf. 1952, Dec. 15, No 30, 221–4, 4 figs

The paper describes a French installation for removing very fine dust of the order of a few microns from industrial installations It is called the wet Prat-Daniel Venturi deduster and is similar to Venturi-scrubbing installations The dust-laden air passes a water curtain before entering a cyclone The high air speed causes effective atomization of the water. Technical details of operation and performance are given

G Nagelschmidt

HINZ, H A. Trockenreinigung fur heisse Gase nach dem Brassert-Kling-Verfahren **[Dry Purification of Hot Gases by the Brassert-Kling Process]** *Staub* Düsseldorf. 1953, Mar 15, No 31, 19–28, 10 figs

This is a method of removal of dust from hot gases by filtration through glass fabric The glass material can be used at considerably higher temperatures than cotton or wool filters (up to more than 350°C) Filter tubes made from it are rigid enough to be mounted on a frame, which is agitated from time to time to remove the dust collected, so that the tubes can be used repeatedly A description of the plant and its operation is given, and extensive experiments are reported at working temperatures of the dusty gas up to 170°C The dust content of the cleaned gas is of the order of 1 5 mgm /m³ and is largely independent of that of the dusty gas Dust removals of about 99·97 per cent are commonly obtained Advantages claimed for the process are reduced capital and operating costs, smaller ground space occupied, lower heat loss from the gas during cleaning, reduced sensitivity to variations in load, and considerably longer filter life

R L Gordon

KAYSE, J. R **Contaminant Characteristics encountered in Local Exhaust Systems. A Graphic Presentation.** *Amer Indust Hyg Ass Quarterly* 1953, June, v 14, No 2, 133–7, 1 graph

The paper is intended to help those concerned with dust control in industry Concentration of dust is expressed as grains (weight) per cubic foot Industrial dusts conveyed through local exhaust systems may vary in concentration from 0 01 grain to 100 grains per cubic foot, with the range being commonly from 1 to 10 grains per cubic foot In ordinary ventilation practice the concentration will be that found in the outside atmosphere, *viz*, 0·2 to 10 grains in 1,000 cubic feet

The prime consideration in connexion with a dust-collecting installation is usually the concentration of dust in the effluent, regardless of that in the inlet. Although other types of collector are used, the 4 main classes are inertial separators, wet scrubbers, fabric arrestors, and electrostatic precipitators A chart is given showing the performance of dust filters and collectors in relation to concentration and particle size This chart can be of much help to the designer of a collecting installation in estimating the probable efficiency of the complete installation, and the average particle size of the effluent.

Thomas Bedford

BANIK, E Neue Wege auf dem Gebiete der industriellen Staubabscheidung. **[New Procedures in Industrial Dust Elimination]** *Gesundheits-Ingenieur.* 1953, Jan, v 74, Nos 1/2, 9–12, 3 figs

A general review of new methods of clearing dust from chimney gases and other industrial dust producers New cyclones, based on the Feifel design (FEIFEL and BENISCHEK, *Der Gesundheitsschutz im staubigen Betrieb Staubsammler im Dienste der gesetzlichen und technischen Staubabwehr.* 1948. Vienna Springer Publications) are discussed first and next ultrasonic agglomeration is described in detail This is chiefly used in the United States. The last part of the paper deals with turbo machines based on the Coriolis effect these are believed to be very promising for the future as they not only clean the air very efficiently but also convey it

G Nagelschmidt

HERSEY, H J, Jr **New Developments in Reverse-Jet Filters.** *Amer Indust Hyg Ass Quarterly* 1953, Sept, v 14, No 3, 177–82, 11 figs

The type of filter with which the author's name is associated uses a thick dense filter medium which increases the effectiveness of the filtration processes of impingement and diffusion in the capture of the smaller particles and the screening out of the larger It does not rely upon the bridging of interstices such as occur in woven fabrics It can filter at much higher velocities than are used with the ordinary type of filter, so that the filter can be more compact Porosity of the filter is maintained by a jet of air at high speed in a direction opposite to that of the normal flow, which moves progressively over the filter medium, thus dislodging particles which tend to clog the filter

This paper describes some of the problems that arise with the use of this filter and some features and possible uses of the appliance

Thomas Bedford

GÄRTNER, H Ueber die Grundlagen einer Schutzstaubanwendung zur Verhütung der Staublungenerkrankungen und die bisherigen Erfahrungen **[The Use of Protective Dust in the Prevention of Pneumoconiosis: the Present Position]** Reprinted from *Berliner Med Zischr* 1950, Feb 15, v 1, Nos 9/10, 4 pp [20 refs]

NAGELSCHMIDT, G & GODBERT, A L. **The Health Hazard of Shales used for Stone Dusting.** *Ministry of Fuel & Power Safety in Mines Research Establishment Res Rep. No. 19* 1951, Mar, 15 pp, 2 figs [32 refs]

"The quartz contents of 22 shales used for stone-dusting and of their respirable fractions below 5

micron equivalent diameter, have been determined by chemical analysis. In the total samples the quartz contents range from 15 to 35 per cent. and in the respirable fractions they range from 8 to 21 per cent.

"Size analyses by screening and the gravimetric sedimentation method showed that the samples conformed, on the whole, to present regulations. The respirable fraction varied from 1 to 25 per cent. of the material passing the 60-mesh (B S S.) sieve

"The evidence from animal experiments, examinations of workers, and quartz determinations on the [illegible] weight to this conclusion.

"Alternative non-siliceous materials, e.g. crushed limestone, are available. There is every reason to suppose that limestone and gypsum dusts are harmless if they are free from silica. It is therefore recommended that shale should not be used for stone-dusting in coal mines."

BEAL, A. J, GRIFFIN, O. G & NAGELSCHMIDT, G. **The Health Hazard of Limestone and Gypsum used for Stone Dusting in Coal Mines.** *Safety in Mines Research Establishment* [Portobello St., Sheffield.] *Research Rept* No 72. 1953, June, 12 mimeographed pp, 2 figs [1s]

It was shown earlier [this *Bulletin*, 1951, v 26, • 1179] that ground shale dust used for stone dusting in mines contained appreciable amounts of quartz and might therefore constitute a silicosis hazard The use of shale has now been abandoned and limestone and gypsum are now the only materials used in British coalmines for stonedusting to prevent coal dust explosions

Some earlier observations have shown that limestone may contain variable quantities of quartz and it seer [illegible] the amount of [illegible] lim [illegible] the [illegible] determined

The quartz content of 30 samples of limestone was determined by chemical and X-ray analysis. Of these samples, 23 had 2 per cent or less of quartz, 3 had between 2 and 3 per cent, 3 between 3 and 20 per cent, and 1 (probably sent in error, it is thought) had over 60 per cent of quartz. Repeated samples after 18 months from the sources of the three samples having 3-20 per cent. of quartz confirmed the previous findings. On the whole, 35 per cent. by weight of the dust was below 10 microns in size, and 20 per cent. below 5 microns

From 6 of the limestone fractions with a particle size below 10 microns were prepared and their quartz content was determined In 4 samples the quartz content was less than in the whole dust; it was equal to that of the whole dust in another, and in the remaining one it was considerably higher.

It thus appears that there may be a silicosis risk arising from the use of impure limestone for stone dust but the risk can be avoided by quality control since there is available an ample supply of limestone

Five representative samples of gypsum dust were examined. The dust distributions were similar to those of the limestone and their quartz content varied between 0 6 and 1 4 per cent.

An appendix describes the chemical determination of quartz in limestone and gypsum

Thomas Bedford

PORTHEINE, F. Über das Vorkommen von Montmorillonit in Kalkstauben, die fur das Gesteinstaubverfahren Verwendung fanden **[On the Occurrence of Montmorillonite in Limestone Dusts Used for Stone Dusting in Coal Mines]** *Arch. f. Hyg. u. Bakt.* 1952, v. 136, No. 8, 631-8, 1 fig [13 refs]

The paper describes a study of the composition of the clay mineral in two impure limestones or marls used for stone dusting; 20 to 30 per cent. of the limestone was insoluble in acid and the finest respirable fractions contained most of this material. The amount of quartz in the samples, determined by a chemical method, was of the order of 5 to 10 per cent.

The author determined base exchange capacities and dehydration curves of the acid-insoluble fractions and concluded that these contained montmorillonite This mineral is said to be possibly dangerous on account of base exchange in the lung tissues

G Nagelschmidt

WEBB, J. C **Atmospheric Conditions in Mines.** 14 mimeographed pp. 1950, July. Sydney. Coal Research Pty. Ltd, 63 Pitt Street

The sources of heat and moisture in mines are reviewed. Measures of warmth—katathermometer and effective temperature—are discussed. [In a reference to effective temperature the author misquotes this reviewer to whom he wrongly attributes the statement that 68°F. is the extreme limit of effective temperature at which efficient work can be done The reviewer found in an investigation of persons (mostly women and girls) doing very light work in British factories during the winter months, and wearing normal indoor clothing, that at an effective temperature of 68°F the average person felt "comfortably warm", i e, not uncomfortable but preferring a somewhat cooler environment That is rather different from saying that efficient work could not be done at a higher temperature—besides, the subjects were performing light tasks not comparable with mining operations]

The faults of the two scales of warmth are pointed out, and attention is drawn to the known discrepancies between the two The author concludes that it is folly to attempt to establish standards of atmospheric conditions in mines on the basis of these indices He

• See above

also quotes various authorities as to the undesirability or impracticability of fixing legal standards, yet he suggests that those in control of the industry should have standards as targets

The concluding section contains statements that appear contradictory It is said that katathermometer cooling power can be used for estimating the

particular the wet kata can be used with confidence, that effective temperature is an excellent indicator of atmospheric conditions, and then, in the next sentence, that it is not in itself a satisfactory index

Finally, the author suggests that dry and wet-kata cooling powers and effective temperatures should be determined, and that the most efficient work will be done when the dry kata cooling power between 5 and 8, the wet-kata cooling power between 15 and 25, and the effective temperature between 55° and 70°F *Thomas Bedford*

SCOTT, D R & HINSLEY, F B **Ventilation Network Theory.** *Colliery Engineering* London 1951, Feb, Apr, June & Dec, v 28, Nos 324, 326, 328 & 334, 67-71, 159-66, 229-35, 497-500, 37 figs [14 refs]

The solution of ventilation networks is of importance in arriving at any forecast of the effect on airflow of any changes in the ventilating system of a mine

and in systems possessing more than one fan

The first part of the paper gives a discussion of

approximations employed, and of correcting for the fan characteristics

Following this account of the method and its use for the solution of some simple problems, the third part of the paper deals with the application of the method to the solution of more difficult examples taken from mining practice

The final section of the paper shows how natural ventilation effects can be fitted into the network theory

This is a paper of first-class importance in mine ventilation, and must be read by those interested

SCOTT, D R & HINSLEY, F B **The Solution of Ventilation Network Problems.** *Trans. Inst Mining Engineers* 1952, Mar, v. 111, Pt. 6, 347-66, 4 figs (3 on 2 folding pls)

One of the main problems in the planning and reorganization of mine ventilation is the estimation of the distribution of airflow and of ventilation pressure in the proposed new or modified networks of shafts and airways Two methods of making these estimations are outlined

The first method is by the use of an electrical analogue in which the ventilation network is simulated by an electrical circuit, the airway resistances being represented by tungsten-filament lamps modified by suitable ohmic resistances In the second method the network problems are solved mathematically by successive approximation

solution of all If several alt ventilation difi computations may become tedious, and the main disadvantage of the lamp method is the time taken to set up the circuit

For the future the most satisfactory arrangement would be the use of some completely automatic computing machine designed for the purpose of solving these network problems, and such a machine would need to be flexible and easily set up The authors are pursuing work on these lines

Thomas Bedford

SCOTT, D R., HUDSON, R F & HINSLEY, F. B **A Calculator for the Solution of Ventilation Network Problems.** *Trans Inst Mining Engineers.* 1953, May, v 112, Pt 8, 623-34, 3 figs

In connexion with ventilation problems in mines it is often necessary to assess the effect of proposed modifications on the air flow. Many alternative schemes may need to be investigated before the best solution is reached Most mine networks cannot be resolved into simple circuits, and solutions to flow problems

network calculator which reduces the duration and tedium of the calculations The calculator consists essentially of a set of variable resistances mounted on a panel, with power supplies and metering arrangements The leads from the resistances are brought out

to a plug board which may be wired to simulate any desired ventilation network. *Thomas Bedford*

SALES, T. J. R. & HINSLEY, F. B. **The Use of Models in the Study of Air-Flow in Mines.** *Trans Inst. Mining Engineers.* 1952, July, v. 111, Pt 10, 773–87, 1 fig. [11 refs] Discussion 788–91.

It is shown that models of mine roadways can be of value in forecasting the friction factors for full-size airways A model of about 9 inches square cross-section gave results in close agreement with those obtained by others in mine airways.

showed a least favourable spacing, with frictional resistance declining as the spacing was increased or decreased. For Reynolds numbers between 50,000 and 300,000 most forms of timbering gave fairly constant frictional coefficients, but below a Reynolds number of 50,000 the coefficient of friction may increase or decrease markedly. At Reynolds numbers above 50,000 the Atkinson coefficient of friction depended mainly on the spacing, relative size, and shape of the timbers *Thomas Bedford*

BROMILOW, J. G **The Ventilation of Coal Mines.** *J Inst Heating & Ventilating Engineers* 1952, Mar, v 19, No 199, 527–53 (Discussion 553–66), 11 figs [21 refs]

gases that may be discharged or generated in the mine, (2) to remove the dust raised by mining operations, and (3) to provide a thermal environment in which men can work efficiently and in reasonable comfort

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In the next part ventilation surveys are discussed These are made to ascertain the quantities of air passing at various points in the ventilation system, to ascertain ventilation pressures at various points and thus to discover where excessive losses of pressure occur, to ascertain where fire-damp is being discharged, and in hot mines, to determine the heat and moisture gained by the ventilating air as it traverses the mine

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Thomas Bedford

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The mining student is likely to find this book of value, for it sets out quite simply many of the types of calculation he is likely to encounter Among other examples are some dealing with pressure surveying and with the resistance of airways, and yet others deal with fan calculations

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Thomas Bedford

HISTASSE, R Contribution à l'étude d'une galerie de ventilateur de mine [**Contribution to the Study of a Mine Ventilation Drift**] *Pub Ass Ingénieurs Facul Polytech de Mons* 1950, No 3, 19–24, 16 figs

After a new ventilation scheme was put into service tests revealed a functional defect that was attributed to the layout of the airways A model one-tenth actual size was constructed in the laboratory for test purposes, and the flow of air in a section of the test gallery—the junction of the main ventilation trunk and the gallery—has been studied It appeared that the loss of pressure here was about seven-tenths that of the whole gallery

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The second scheme gave the better results in the tests Pressure losses were reduced, and velocity contours over the cross-sectional area of the duct showed a much more even velocity of flow

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MIDDENDORF, H Die Sonderbewetterung von Gesteinsbetrieben [**Auxiliary Mine Ventilation**] *Mechanisches Auffahren von Strecken* Essen [Glückauf] 1950, 105–10, 3 figs

This paper summarizes up-to-date information on auxiliary mine ventilation, a subject which gets

blowing directly to the working places and this is the main method to be used in the future Two procedures have been introduced recently for protecting men below ground during and after shot-firing One is the use of steel chambers kept under excess pressure of fresh air, in which men shelter for a short time The other is the use of mist curtains for 6–8 minutes during and after shot-firing The blasting fumes and the dust are then removed by these curtains, which are generated by 4 to 6 nozzles using 10 litres of water each per minute.

The main part of the paper discusses engineering detail In the past it was usual to instal a fan for ventilation , after a few hundred yards of roadway

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There is a long discussion of different kinds of ducting materials and their relative merits A diameter of 2 feet (600 mm) is now standard in Germany Heat insulation and joining methods are discussed A description is given of small mobile refrigerator units which are used in hot mines.

G Nagelschmidt

MORRIS, I H & HINSLEY, F. B **Some Factors affecting the Choice of Fans for Mine Ventilation.** *Trans Inst Mining Engineers* 1952, May, v 111, Pt 8, 489–508, figs 1–5 Discussion 508–21, figs 6–8

those obtained with axial-flow fans, and interest in centrifugal fans is being revived

is difficult of attainment, but modern designs go far towards providing the desirable flexibility

Some of the data presented were obtained from experimental work on a variable-pitch axial fan when operated as a two-stage or as a one-stage unit This fan gave a comparatively poor performance when running in reverse The effect of varying the pitch of the blades is mainly on the volume of air

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results

Thomas Bedford

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16 figs

After a new ventilation scheme was put into service tests revealed a functional defect that was attributed to the layout of the airways A model one-tenth actual size was constructed in the laboratory for test purposes, and the flow of air in a section of the test gallery—the junction of the main ventilation trunk and the gallery—has been studied It appeared that the loss of pressure here was about seven-tenths that of the whole gallery

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BROMILOW, J G **The Ventilation of Coal Mines.** *J. Inst Heating & Ventilating Engineers* 1952, Mar, v 19, No 199, 527–53 (Discussion 553–66), 11 figs [21 refs]

The first part of the paper gives a brief description of a mine ventilation system In the second part the main purposes of ventilation are discussed These are (1) to remove the fire-damp, black-damp, oxides of nitrogen, carbon monoxide, and any other noxious gases that may be discharged or generated in the mine; (2) to remove the dust raised by mining operations, and (3) to provide a thermal environment in which men can work efficiently and in reasonable comfort

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In the second part, the ventilation installations in the plants of *Electricité de France* are described. The sizes of galleries, lengths ventilated, sizes of air-lines, air pressures and air leakages at different plants are summarized Commonly, impulsion ventilation is used In many instances, air is aspirated for a time after firing, and then impulsion is re-commenced. At one plant impulsion is used during work, then after firing impulsion is continued for two or three minutes, then air is aspirated for a short time, and after that impulsion is begun again At another plant impulsion ventilation is kept going continuously.

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Experimental trials were made of two ideas for improvement · firstly, the placing of fins along the gallery parallel with its axis, thus subdividing the junction into a number of galleries of equal cross-section, travelling in parallel, without altering the layout, and secondly, by modifying the layout within limits imposed by the colliery management In this second scheme the double curvature of the gallery, with its radiused bends, was replaced by two right-angle bends in which were fixed aerodynamically-designed guide vanes

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This paper summarizes up-to-date information on auxiliary mine ventilation, a subject which gets more important as the length, depth and temperature of underground workings increase

In principle, ventilation by exhaust is better than ventilation by blowing, for rapid removal of toxic gases or dust, but as length of roadway and temperature increase it is necessary to introduce fresh air by blowing directly to the working places and this is the main method to be used in the future Two procedures have been introduced recently for protecting men below ground during and after shot-firing One is the use of steel chambers kept under excess pressure of fresh air, in which men shelter for a short time The other is the use of mist curtains for 6–8 minutes during and after shot-firing The blasting fumes and the dust are then removed by these curtains, which are generated by 4 to 6 nozzles using 10 litres of water each per minute

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Thomas Bedford

HASSELT. INSTITUT D'HYGIÈNE DES MINES Gén / 162 Communication No 86 Climatisation Étude du bilan thermique de cinq charbonnages de Campine [LEDENT, P] **[Study of Relative Sources of Heat in Five Coal Mines in the Campine Area]** 1951, June 15, 21 mimeographed pp, 9 figs

This paper attempts to estimate the relative importance of the different sources of heat in mines,

heat given off in all mines surveyed came from the

prohibitive ventilation costs The effect of lay-out is demonstrated by expressing heat given off in terms of production, since all other sources of heat are directly related to production On the basis of a maximum mean wet-bulb temperature of 28°C, ventilation requirements per metric ton mined are calculated for various depths of working

This account will be of considerable interest to mining engineers and all concerned with mine ventilation *J McK Ellison*

HASSELT INSTITUT D'HYGIÈNE DES MINES Communication hors-serie. La réfrigération des chantiers miniers profonds en Belgique [HOUBERECHTS, A, Director]. **Refrigeration of Deep Mine Workings in Belgium]** 1951 27 pp, 4 figs

This semi-popular account begins with a very

(93 2°F.) and impossible above 35°C. (95°F.) In

refrigeration may be necessary. Recent studies [see this *Bulletin*, 1952, v. 26, 166] of coal mines producing 4,500–5,000 metric tons a day indicate that 70–75 per cent of heat extracted by ventilation comes from the cooling of the rocks and the oxidation of coal by air, and 10–15 per cent. from installations. These vary with age of working, and seasonal variation at the surface gives rise to much smaller variation, lagged in time, underground. Adiabatic autocompression causes a temperature rise of about 1°C per 100 m depth (1°F, per 182 ft). The wet

between production, intake temperature, and airflow.

can be calculated Factors determining choice of installation are listed, and the first such installation in a coal mine is described Highly satisfactory results are claimed.

[This account should interest all concerned with mine ventilation.] *J. McK. Ellison*

HASSELT INSTITUT D'HYGIENE DES MINES Gén / 172 Communication No 91 Étude du climat des chantiers souterrains Quelques applications du diagramme (j,x) de l air humide dans l'étude de problèmes miniers [HOUBERECHTS, A, Director] **[Climatic Studies of Underground Workings. Some Applications of the j–x Diagram to Mining Problems]** 43 mimeographed pp, 16 figs & 1 folding diagram [11 refs] 1952, Jan 31

This paper greatly extends the usefulness of the j–x diagram (Mollier psychrometric chart) by making it applicable at all pressures The diagram relates the enthalpy of air, j, to its absolute humidity, x (kgm H_2O per kgm dry air) [As used in this paper, the enthalpy of the air-water vapour mixture at t°C may be defined as the heat required to raise the temperature of 1 kgm of dry air from 0°C to t°C, plus that required to convert x kgm of liquid water at 0°C. to water-vapour at t°C] Though well adapted for use in environmental hygiene the

* See above

passed for the effect on fan pressure ...

explained. Experimental work on a small aerofoil-bladed centrifugal fan showed total fan efficiencies of over 82 per cent

Suggestions are made regarding the type of information needed by mining engineers when considering the choice of fans. The factors affecting this choice are many and varied

The paper provoked an interesting discussion, the account of which should be read with the paper.

Thomas Bedford

HASSELT · INSTITUT D'HYGIÈNE DES MINES. Gén./156 Communication No. 81. Lutte contre les poussières Étude de l'élimination des poussières et des fumées de tir dans un travers-bancs en creusement aux charbonnages de Limbourg Meuse **[Study of the Elimination of Dust and Shot-Firing Fumes in a Cross-Cut in Workings at a Coal Mine of Limburg Meuse]** [HOUBERECHTS, A , Director]. 13 mimeographed pp., 4 figs & 2 charts.

In the trials reported here two methods for the elimination of dust and fumes were tried · (*a*) reversal of the ventilation, and (*b*) maintenance of blower ventilation, and the installation of a bank of atomizers to bring down the stirred-up dust.

The test gallery was ventilated by a pipe-line, 600 mm in diameter and 700 metres in length, equipped with two blower ventilators A third ventilator worked in the opposite direction, and a by-pass arrangement allowed of the reversal of the air flow at the time of firing Tests were made during three consecutive days. On the first the ventilation was continued unchanged. On the second day at

time of firing and re-established 25 minutes afterwards, and the atomizers discharged their water spray during that period

Carbon monoxide concentrations were estimated by means of hopcalite and by a colorimetric detector. A midget impinger and a thermal precipitator were used for dust determination

The atomizers were found to have little effect in reducing the concentration of either dust or fumes, and they had the disadvantage of raising the atmospheric humidity. Impulsion ventilation, without reversal to aspiration at the time of firing, seemed acceptable when only the shotfirer stayed in the place The clearing of the atmosphere near the face is very quick so that one can traverse it if the stay is not longer than, say, 2 minutes The method is undesirable when the men remain in the return airway, on account of the slow passage of the fumes they would remain in the dust for 20 to 25 minutes, or even longer if the ventilation were not brisk.

Reversal of the air flow on firing gave wholly satisfactory results. Men could return to the face within 10 to 15 minutes after the restoration of impulsion ventilation. There were, however, certain difficulties

For very long workings where reversal of ventilation presents real difficulties, and where shots cannot always be fired ...

so that the fumes and dust can be by-passed from the zone occupied by the men.

Thomas Bedford

BIDLOT, R. & LEDENT, P. Climatisation souterraine. L'installation de réfrigération de l'air du Charbonnage des Liégeois ...

No. 7, 10 pp , 10 figs. [15 refs.]

The geothermic gradient in the Campine Basin is ...

difficult on account of the heat. Thermal conditions and their effects are discussed Observations with the globe thermometer show that ...

ture does not exceed 31°C (87·8°F.)

In the Campine Basin the deepest mine is the Charbonnage des Liégeois, with its shaft of 1,010 metres. The coal production is about 4,000 tons a day An exhaust fan at the surface extracts 210 cubic metres of air per second. With the development at the depth of 1,010 metres the climatic problem has become acute Various methods of cooling were discussed, and it was decided to make a trial of air cooling by means of a mechanical refrigerator situated underground

treat the air supplied to a long wall face 150 metres in length The air passed over the heat exchanger was first filtered so that the surfaces of the exchanger

leaving the face were ... (dry-bulb and ... ntrance to ... it from it ... advanced

by something over 200 metres, the temperatures at the entrance to the face were 66 7°F. dry-bulb and 64 9°F. wet-bulb, while the exit temperatures, dry-bulb and wet-bulb, were 91 8°F., and 86 4°F In June, 1949, the refrigerator was removing heat from the air at the rate of 300,000 k cals per hour (1,190,000 B Th U. per hour), between the refrigerator and the entrance to the coalface one-tenth of this amount of heat had been regained, and along the length of the coalface the heat gain was estimated at 720,000 k cals. per hour (2,857,000 B Th.U. per hour).

Thomas Bedford

HASSELT INSTITUT D'HYGIÈNE DES MINES Gén /
162 Communication No 86 Climatisation Étude du bilan thermique de cinq charbonnages de Campine [LEDENT, P] [**Study of Relative Sources of Heat in Five Coal Mines in the Campine Area**] 1951, June 15, 21 mimeographed pp , 9 figs

This paper attempts to estimate the relative importance of the different sources of heat in mines, mainly on the basis of climatic surveys carried out in five Belgian coal mines, all about 800 m in depth Various improvements are suggested to reduce heating by equipment, but since over 60 per cent of the heat given off in all mines surveyed came from the surrounding rocks and from oxidation of coal in the workings, and this proportion increases with depth, it is suggested that only planning of development to minimize heat from these sources could prevent prohibitive ventilation costs The effect of lay-out is demonstrated by expressing heat given off in terms of production, since all other sources of heat are directly related to production On the basis of a maximum mean wet-bulb temperature of 28°C , ventilation requirements per metric ton mined are calculated for various depths of working

This account will be of considerable interest to mining engineers and all concerned with mine ventilation

J McK Ellison

HASSELT INSTITUT D'HYGIÈNE DES MINES Communication hors-serie. La réfrigération des chantiers miniers profonds en Belgique [HOUBERECHTS, A., Director] [**Refrigeration of Deep Mine Workings in Belgium**] 1951 27 pp , 4 figs

This semi-popular account begins with a very brief summary of recent U.S and British data on the effects on man of high temperatures, and goes on to consider the application of this to conditions prevailing in deep coal mines A scheme for the refrigeration of some workings in the Belgian pit is described

Under mine conditions of ventilation, radiation and the differential effect of air speed are unimportant, and wet and dry bulb temperatures (t_h and t_s) determine thermal stress This can be expressed as an effective temperature 0 9t_h+0 1t_s continuous heavy work is distressing when this exceeds 34°C (93 2°F) and impossible above 35°C. (95°F.). In Belgium, the accepted limit is 31°C (88 8°F.). Below 1,000 m. (3,280 ft.) underground, in damp coal mines, cooling by ventilation alone may be insufficient, and to keep the temperature down to this limit refrigeration may be necessary Recent studies [see* this *Bulletin*, 1952, v. 26, 166] of coal mines producing 4,500–5,000 metric tons a day indicate that 70–75 per cent of heat extracted by ventilation comes from the cooling of the rocks and the oxidation of coal by air, and 10–15 per cent from installations These vary with age of working, and seasonal variation at the surface gives rise to much smaller variation, lagged in time, underground Adiabatic autocompression causes a temperature rise of about 1°C per 100 m depth (1°F. per 182 ft) The wet bulb temperature also varies, humidity being normally about 80 per cent. The author, however, in deriving limiting conditions, assumes for simplicity that the air leaves the galleries saturated at 30°C. (86°F.), and plots heat extracted (Kcal/hour) against airflow (kgm air/sec), for different intake temperatures , on the same graph heat production is plotted against airflow for different production rates The intersections of the two sets of curves give the relation between production, intake temperature, and airflow. If the air temperature at entry is high the ventilation needed for high production may be prohibitive, especially in narrow workings Given reasonably good ventilation, refrigeration may be cheaper than increased ventilation From the graph given, the intake temperature required (and thus the cooling) can be calculated Factors determining choice of installation are listed, and the first such installation in a coal mine is described. Highly satisfactory results are claimed

[This account should interest all concerned with mine ventilation]

J. McK. Ellison

HASSELT INSTITUT D'HYGIENE DES MINES Gén /
172 Communication No 91 Étude du climat des chantiers souterrains Quelques applications du diagramme (j,x) de l'air humide dans l'étude de problèmes miniers [HOUBERECHTS, A , Director] [**Climatic Studies of Underground Workings. Some Applications of the j–x Diagram to Mining Problems**] 43 mimeographed pp , 16 figs & 1 folding diagram [11 refs] 1952, Jan 31

This paper greatly extends the usefulness of the j–x diagram (Mollier psychrometric chart) by making it applicable at all pressures The diagram relates the enthalpy of air, j, to its absolute humidity, x (kgm H_2O per kgm dry air) [As used in this paper, the enthalpy of the air-water vapour mixture at t°C may be defined as the heat required to raise the temperature of 1 kgm of dry air from 0°C. to t°C , plus that required to convert x kgm of liquid water at 0°C. to water-vapour at t°C.] Though well adapted for use in environmental hygiene the

* See above

diagram is intended for the use of mining engineers and is presented in terms of their problems By means of it, it is possible to predict the behaviour of humid air as temperature and pressure are varied, or when two mixtures of different compositions or at different temperatures intermingle

After describing the main characteristics of the earlier j-x diagram, its uses are extended by replacing lines of ϕ=const by lines of ϕ/p=const. (x=ratio of partial pressure of water vapour to saturation vapour pressure of water: p=total pressure of mixture) So supplemented, the j-x diagram can be used at any pressure, and thus can be applied to the complete air circuit above and below ground, and to the operations of compressed

This diagram should prove extremely useful to mining engineers, its description assumes, however, a complete familiarity with very elementary thermodynamics *J McK Ellison*

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No. 4, 117-54, 20 figs. [10 refs.]

The thermal environment at the coalface depends on the amounts of heat and of water vapour taken up

theoretical calculations are compared with measurements made in one of the Netherlands State mines

Consideration is given first to the cooling of the rock around a stone drift by a ventilating current. Actual measurements show (i) that the cooling takes place more quickly than would be expected from theoretical calculations, (ii) that in carboniferous rocks the conduction of heat is highly anisotropic, and (iii) that it is of no use cooling a stone drift more than 2 years before coal-getting on that level is started.

The temperature of the air in a stone drift is next dealt with For conditions when the evaporation of water can be ignored the equation due to Stočes and Černik is quoted. For humid drifts, when the

compared with measurements.

A further section deals with the temperature of the air in a heading ventilated by means of air pipes. The temperatures of the air inside and outside the pipes are calculated, and it is shown that thermal insulation of the air pipes may have a substantial and beneficial effect.

Finally, the temperature of the air in the downcast shaft is considered, and an equation which takes into account the increase in rock temperature, the heats of compression, of oxidation, and from compressed-air pipes, and also the evaporation. Measurements showed that in the pit where tests were made the heating effect of oxidation and compressed-air pipes was considerable. A heat balance is given for the shaft from the surface to a depth of 272 metres. Of the total heat-gain of 34,500 kcal per min., compression accounted for 13,600 kcal., conduction for 9,400 kcal, and oxidation the remaining 11,500 kcal per min. Of this heat 18 per cent. was expanded in evaporating water and the remaining 82 per cent on the warming of the air. *Thomas Bedford*

Pearce, S J & Berger, L B **List of Respiratory Protective Devices approved by the Bureau of Mines.** *U S Bur Min Inform Circ* 7570 Wash 1950, June, pp ii + 16, 14 figs

Hasenclever, D **Über eine neue Anlage zur Prüfung von Staubschutzmasken und Sand-**

A new installation for official testing and licensing of dust respirators has been set up at the Central Dust Research Institute in Bonn, and the present paper describes mainly the equipment which is used for measuring filtering efficiency

Freshly ground quartz is used for generating the

ends which carry sets of sieves to achieve laminar flow, and a central free portion about 2 cubic metres in volume Inside the central portion is a dummy head which carries the mask to be tested It is connected by tubing to the outside air A probe is introduced near the mouth to sample the dust cloud From the chamber the dust-laden air is drawn through a further duct which can be used to test cloth filters The air is then cleaned by a cyclone and discharged into the open air at roof height

By using various by-pass arrangements the air

ments are made by konimeter or tyndallometer Both can be switched by three-way taps either to sample the dust cloud or the air that has passed through the mask Konimeter records can be evaluated photometrically by special equipment, which will be described in a separate publication An electrical

A few figures given in the introduction reveal that three classes of dust respirators are distinguished in Germany Class 1 retains 60 to 70 per cent and classes 2 and 3 over 93 per cent of the standard cloud (150–180 mgm per m³ of dust below 20 microns).

G Nagelschmidt

VOSSENAAR, A H Die Prüfung von Industrie-Staubmasken **[Testing Industrial Dust Respirators (Masks)]** *Staub* Dusseldorf 1952, Mar 15, No 28, 47–74, 11 figs

This is a general article which includes details about a dust-mask testing plant developed by the Dutch

as possible to those arising in practice This concerns the type of dust used for testing and the duration of each test, which should last several hours, it is also most important to measure the resistance continually A conventional review of dust-measuring instruments is given and an improvement is mentioned which the author made to the Owens jet dust counter by incorporating a controlling spring Surface parameters (Tyndallometer) or microscope size counts are preferred to gravimetric dust measurements

After reviewing various unsuccessful or partly successful installations and pointing out their defects, the author describes the plant now in use in Holland The dusts used are ground sandstone and loess These are fed into the apparatus continuously by suction produced by a compressed air ejector A cyclone and settling chamber remove the particles above 6 microns, and by adding a clean air supply dust concentrations can be varied *The usual flow rate is of the order of* 10 litres per minute and the test cloud contains approximately 100,000 particles per cc or less Dust measurements are made with thermal precipitators and a Pulfrich photometer

The mask itself is tested in the main test chamber, the dimensions of which are not given, either by continuous suction or by an artificial-lung type of intermittent suction, usually at a rate of 19 times 1 4 litres per minute The pressure drop across the mask as well as dust concentrations just before and behind the mask can be measured

Of the different types of masks tested, rubber sponge types were found to be worst, especially when wet Test data for good masks in use in the mines now are given General remarks deal with different types of outlet valve and with the desirability of avoiding dead space as much as possible when constructing a mask Finally, a number of papers dealing with masks giving a fresh air supply at a fixed point are discussed *G Nagelschmidt*

STAUB Düsseldorf 1952, June 15, No 29, 117–27.

I After the second world war the German Committee for dust respirators, which had been responsible for licensing respirators, had ceased to function. A new committee dealing with protection against dusts and gases is now set up Its decisions and recommendations must be followed by the industrial health authorities and insurance carriers (Berufsgenossenschaften) Its main purpose is to foster co-operation between the producers and users of masks and to improve the protection of the workers in hazardous occupations The personnel of this

Research Institute in Bonn.

compensation cases in the period 1948 to 1950 Prevention is necessary as there is no cure for these diseases A short introduction explains the health hazard, where quartz, asbestos and basic slag are listed as specially dangerous

[illegible] su [illegible] br [illegible] fil [illegible] coarse dust (class 1), against fine dust (class 2) and against dust and gas mixtures (class 3)

Typical filter materials, general principles of construction, resistance to breathing, and main fields of use for the three types are listed A short section deals with fitting, cleaning and servicing of masks *G Nagelschmidt*

GEROSA, G, GHIRINGHELLI, L., GRIFFINI, A, MOLINA, C, PASARGIKLIAN, M & ZURLO, N. [illegible] No 11, 391–417, 10 figs

The English summary appended to the paper is as follows —

"The authors have studied the properties of two respirators for respiratory protection, both [illegible] filter with bellows [illegible] resistance of 6 mm H_2O for an air flow of 30 l per minute and has a dead space of 250 cm³.

"The respirator '*Model 640*' can be used either with 2 cellulose filters or 2 electrostatic filters (the cellulose filters have an area of 454 cm², the electrostatic fil[illegible] ness of [illegible] an air f[illegible] *40 cc* [illegible] by asse[illegible] filters for types of smoke and of dust, 2) the effect exercised on the respiratory function and on the working capacity of the wearer.

"*The first study* of chemico-physical nature (authors ZURLO, GEROSA, GRIFFINI) was effected by passing through the filters atmospheric suspensions of the following types of fine dust and fumes; quartz, silicagel, black petrol fumes, vegetable carbon and iron, lead, zinc, and cadmium fumes The atmospheric *concentration* of dust and fumes was determined before and after passing through the filter. In the case of dust granulometry was also determined. The increase in the resistance of the filter was measured during the passage of the dusty air

"From the results obtained it was shown that the cellulose filter arrests all the dust particles of a diameter of >1 micron; 80 per cent of particles of 0·8 micron is still retained The dust deposited slowly increases the resistance of the filter. To raise the standard resistance to the maximum permissible limit of 18 mm of H_2O for an air flow of 30 l/min, in the case of the model 320 filter would require 6×10^9 dust particles, in that of the model 640 15×10^9 particles. The quantity of dust necessary to clog the filter is proportional to the cube of the surface of the filter; the dust required to clog the filter is appreciably reduced by the dead space; a dead [illegible] the limit resistance after sixteen hours and with an air flow containing 2000 particles per cmc. The electrostatic filter holds back 97 43 per cent of iron fumes, and of other fumes up to 94 4 per cent for lead; 88 93 per cent for zinc and 87·42 per cent for cadmium

"The clogging speed of the electrostatic filter is very slow, it can be used for several days without being changed.

"*The second study* of physiological character (authors. PASARGIKLIAN, GHIRINGHELLI, MOLINA) was effected by making those subjected to experiment walk on an ergometer at low, medium and high speeds Each track covered was executed first without a respirator, thereafter with each of the two types of respirators Each respirator was tested with its filter of standard resistance of 3–6 mm H_2O; and subsequently with filters of a standard resistance of *10–25–54 mm H_2O, for an air flow of 30 l/min.*

"The results obtained showed:

"*a*) The 'Model 320' respirator caused increased pulmonary ventilation (50 per cent) and reduction of the respiratory energy output When the resistance of the filter exceeds 25 mm H_2O it causes a feeling of uneasiness and reduction of the maximum aerobic working capacity (38%); therefore it is unfit for industrial use

[illegible] slight decrease in the pulmonary ventilation and an increase of its energy output, without however any modification of the maximum aerobic working capacity, therefore it is perfectly fit for industrial use as anti-dust and anti-fumes respirator."

HASSELT. INSTITUT D'HYGIÈNE DES MINES Gén / 198 Communication No 103 Lutte contre les poussières Contrôle de l'efficacité des masques filtrants **[Dust Control; Tests of Efficacy of Mask Filters]** [HOUBERECHTS, A & DEGUELDRE, G] 1953, Feb 28, 21 mimeographed pp, 5 figs. (2 on pl.) [13 refs]

This paper describes and discusses previous methods of testing mask filters and describes tests recently evolved in Belgium

The desiderata for mask filters are outlined particularly in relation to the dependence of efficiency on particle size and to the reduction of dead space The tests employed in France and Germany, and the performances required in order to pass them, are summarized and discussed They are criticized on the grounds that not enough attention is paid to the dependence of efficiency on particle size, and that the measurements of resistance are not closely enough

size and the ...

John McK Ellison

HASSELT INSTITUT D'HYGIÈNE DES MINES Gén / 210 Communication No 110 Lutte contre les poussières Essais de masques anti-poussières 1ère série **[Tests of Dust Mask Filters: First Series]** [HOUBERECHTS, A & DEGUELDRE, G] 1953, Oct. 2, 8 mimeographed pp , 12 figs on 6 pls

—— Gén /215 Communication No 111 Lutte contre les poussières Essais de masques anti-poussières 2ème série **[Tests of Dust Mask Filters: Second Series]** [HOUBERECHTS, A & DEGUELDRE, G] 1953, Oct 30, 9 mimeographed pp , 12 figs on 6 pls Addenda, 3 mimeographed pp

The results of tests carried out on a number of mask filters of Western European origin and one from the United States, are presented (Communication 110–12 types of filters; communication 111–14 types; addenda—2 types) The test equipment has been described previously [see above] The principal criteria used were dust retention (mean value greater than 95 per cent over 3 hours, particles smaller than 5 microns), and resistance to breathing

John McK Ellison

HASSELT INSTITUT D'HYGIÈNE DES MINES Comm

6 pls.

The report describes the results of tests on 12 types of dust mask supplied commercially For a mask to be accepted as satisfactory the authors require that 4 criteria shall be met The resistance to inspiration must not exceed 15 mm. of water, nor the resistance to expiration 5 mm , when the flow of air is 50 litres per min When the atmosphere contains 300 to 350 mgm per cu m of coal dust with 8 per cent. of rock dust, all particles being below 5 microns in size, the mask must be capable of retaining 95 per cent of the dust after 3 hours Finally, a mask is regarded as unsatisfactory if through clogging of the filter the total resistance to the flow of air exceeds 16 mm of water after use for 90 min with 26 respirations of 1 6 litres per min

Of the 12 masks only 2 met all the requirements. Three were rejected because they failed to retain enough dust and there was also excessive clogging In one of these the resistance to expiration was also too high Two other masks had too great a resistance to inspiration and suffered from excessive clogging, and one of them also offered too much resistance to expiration. Yet another 4 masks were rejected on grounds of excessive resistance to expiration, and with one of them there was also excessive clogging. Finally, one mask was at fault solely on account of clogging, but the rise in pressure due to this cause was not greatly in excess of the accepted limit, and it is remarked by the authors that in view of its otherwise satisfactory performance it could be accepted

Thomas Bedford

LÄMMERT, A Anwendung von Frischluftgeraten zur Verhutung von Staubkrankheiten **[The Use of Fresh-Air Masks for Pneumoconiosis Prevention]** *Staub* Dusseldorf 1954, Mar 15, No. 35, 39-47, 8 figs

The paper sketches the author's attempts to develop fresh-air masks during the last 25 years Only during the last few years have satisfactory models been produced The main new feature is the omission of all valves, making use of the principle that only part of the fresh air is actually inhaled whereas the remainder streams past the face

Discomfort from cold or dry air is avoided by a double chamber system by which the inhaled air is humidified from the moisture from exhaled air. It is also possible to insert electric heater elements into the air supply Two models, one made by the firm of Bartels and Rieger, Cologne, the other by Dragerwerke, Lubeck, are illustrated Oil cleaners, pressure reducers and volume meters are discussed

The lack of mobility which at first sight appears as the main drawback can be overcome by various systems of spring-controlled overhead ducting, which are described

It is said that these new fresh-air masks are welcomed by workers in a variety of dusty occupations, including coal loading underground. Very often they are very much cheaper than other forms of dust control and they are said to give complete protection.

G Nagelsc

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